Electrical World

McGraw-Hill Company, Inc. New York, July 27, 1918 15c a copy

GENERAL LIBRARY
JUL 30 1918
UNIV. OF MICH.

Equip the Motor With

GURNEY

BALL BEARINGS

to prevent power waste, to insure the greatest factor of safety and to provide greater load capacity than any other bearings of equal size.

Gurney Ball Bearing Co.

Conrad Patent Licensee

JAMESTOWN, N. Y.

Weston

Electrical Indicating Instruments

are unqualifiedly superior to any other instruments designed for the same service.

A.C. or D.C., Switchboard or Portable Instruments for every field of Indicating Electrical Measurement. In writing for catalogs and bulletins please specify the field that interests you.

WESTON ELECTRICAL INSTRUMENT CO., 13 Weston Ave., Newark, N. J.

23 Branch Offices in the Largest Cities

Vol. 72, No. 4 New York, July 27, 1918 *Pages 145–192*

Electrical World

F. M. FEIKER, *Editorial Director* W. H. ONKEN, JR., *Editor*

Member Audit Bureau of Circulations, Member Associated Business Papers, Inc.

Contents

Editorials 145

Storing Coal in a Small Plant 148
Description of Method Used in a Medium-Size Plant Where a Flexible System of Portable Conveyors Is Tied in with Coal-handling Equipment—Circular System of Piling Adopted—Estimated Cost of Storing and Reclaiming, 20 Cents per Ton.

Characteristics of Iron and Steel Conductors—I 150
By Charles E. Oakes and P. A. B. Sahm.
The Use of Iron and Steel for Transmission Conductors Has Been Greatly Stimulated by War Emergencies—Complete Test Data for Calculation of Electrical Characteristics Now Available.

Motor Drive in Paper and Pulp Mills—I 152
By C. E. Clewell.
Important Applications, Particularly Beaters and Grinders—Variations in Power Requirements—Examples of Group and Individual Drive Showing Type of Installation That Has Worked Out Well in These Plants.

California's Electrical Co-operative Campaign 155
By S. M. Kennedy.
Outline of the First Year's Activities Carried On in That State for the Purpose of Developing Maximum Intelligent Distribution of Electrical Goods Throughout All Branches of the Industry.

What Commissions Are Doing on Rates 158
Careful Review of Conditions in California, Where the Applications So Far Cover More than 50 per Cent of the Electric Utility Business—Action in Other States.

Motor Drive in Newburgh Shipyard 160
Standard Types Chosen to Insure Prompt Delivery—Individual Motor Drive Selected for Speeding Output—Foolproof Equipment Permits Use of Unskilled Labor.

Book Reviews 161

Station and Operating Practice 162

Central Station Service 165

Technical Theory and Practice 168

News of the Industry 171

Recent Court Decisions 177

Associations and Societies 177

Current News Notes 178

Commission Rulings 178

Men of the Industry 179

Trade and Market Conditions 180

Current Prices of Electrical Supplies 184

New Apparatus and Appliances 186

Trade Notes 188

Trade Publications 189

New Incorporations 189

Construction News 190

Record of Electrical Patents 192

Advertising Indexes—Alphabetical, 109; Classified, 105-107; Searchlight Section, 38-61

JAMES H. McGRAW, *President* ARTHUR J. BALDWIN, *Vice-President* E. J. MEHREN, *Vice-President* EDWARD CALDWELL, *Treasurer* JAMES H. McGRAW, JR., *Secretary*

McGRAW-HILL COMPANY, Inc., 10th Avenue at 36th St., NEW YORK

CABLE ADDRESS, "Machinist"

WASHINGTON, 1410 H St., N. W.
CHICAGO, 1570 Old Colony Building
CLEVELAND, Leader-News Building
PHILADELPHIA, Real Estate Trust Building
SALT LAKE CITY, 1101 Newhouse Building
SAN FRANCISCO, Rialto Building
LONDON, 10 Norfolk St., Strand

Publishers also of
Electrical Merchandising
Power
Electric Railway Journal
American Machinist
Engineering News-Record
Chemical and Metallurgical Engineering
Engineering and Mining Journal
Coal Age

United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines, $3 per year; Canada, $4.50; elsewhere, $6. Single copy, 15c.

No back volumes for more than one year and no back copies for more than three months.

Change of Address—When change of address is ordered the new and the old address must be given. Notice must be received at least ten days before the change takes place.

Copyright, 1918, McGraw-Hill Company, Inc. Published Weekly. Entered as second-class matter, Jan. 20, 1907, at the Post Office at New York, N. Y., under the Act of March 3, 1879.

Circulation of this issue 21,000 copies

ELECTRICAL WORLD—*Member Society for Electrical Development, Inc.*—"DO IT ELECTRICALLY"

Westinghouse Catalogue No. 3B Instruments and Relays

These pages show a number of new instruments as described and illustrated in the last edition of Catalog 3-B, just off the press.

To keep abreast of instrument development you should have this catalog in your files.

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.

Sales Offices in All Large American Cities

Westinghouse

Electrical World

The consolidation of ELECTRICAL WORLD, ELECTRICAL ENGINEER *and* AMERICAN ELECTRICIAN

Volume 72 New York, Saturday, July 27, 1918 *Number* 4

Making the Most of Interconnection

INTERCONNECTION of energy supply systems is no longer a matter of merely economic importance. In the face of fuel conditions apprehended next fall and winter, it is now essential to take every feasible step to increase territorial load factors and thus to realize the utmost reserve capacity resident in existing plants. In normal times the presence of idle reserve capacity far beyond the minimum necessary for good service often passes almost unnoticed, but to-day and to-morrow the war work of the nation demands and will require that electrical supply companies go the limit in putting their generating, transmission and distribution equipment into essential use. This means sailing closer to the wind as to reserve power than former practice has approved in many individual stations, but the diversity factors of such plants when skillfully interconnected and administered for the common benefit will save the day.

General agreement as to the wisdom of any particular plan is, we believe, a basic feature of any program which can be put through with minimum delay, and without invoking the strong right arm of the already overworked government to bring about co-operation which should be offered as a matter of patriotism among the various interests concerned. It is proper to require that the fuel-saving capabilities of such a plan be made clear to those who are to take part in it and to benefit thereby; but with this done, there should be immediate willingness to go ahead. This is no time in which to oppose interconnection on petty grounds; and if such a scheme in any case is to yield the maximum results, the parties to it must enter upon it in a spirit of give and take, ready to change existing plant routine in the interest of ultimate economic gain.

It will be helpful, also, to fix a certain standard of plant efficiency—say two pounds per kilowatt-hour—as the maximum allowable consumption of coal which an economical station should reach in working in multiple harness; that is, plants above this figure may well be classed as purely reserve stations, and those attaining or bettering it as the truly efficient burden bearers of the plan. So far as practicable, tidewater stations of relatively large capacity should be included in any interconnection program in the seaboard states, and it goes without saying that available water power must be turned to the utmost account.

Finally, one need not wait for the perfection of an elaborated program before making a beginning, in many instances at least, by interconnecting adjacent systems. Even a partial application of intersection tie-line service is already helping in many cases to carry on the war from the fuel standpoint. If the value of each particular plan is made clear, it ought to be no difficult matter to raise the necessary capital, whether with government assistance or otherwise; for in the first place the cost of releasing hitherto unavailable reserve capacity for wider use is generally very moderate in comparison with the cost of new plant construction, and secondly, the saving of fuel, labor and power is absolutely essential to the military program of the nation. Interconnection is now a military necessity and should be pushed with might and main by all having power to develop it for useful service.

The Everlasting Fuel Question

AS SUMMER draws on there appears above the horizon the customary interrogation point regarding next winter's fuel supply. Every week the electric central stations find their load of necessary war work steadily increasing; and if this necessary branch of service is to be maintained, fuel must be forthcoming in reliable quantity, and promptly. To-day the central stations do not know where they stand. The only thing of which they are sure is the reality of that ignorance. Nearly everybody is now getting used to the idea of utilizing whatever in the way of coal can be most readily obtained, and the zone system which has been inaugurated, while sometimes inconvenient, is likely at least to facilitate transportation. The chief trouble is that we have no basis for future plans. First, we are all going to have enough coal; second, we are not going to have enough coal; third, it must be ordered at once and the future so far as possible looked out for; fourth, if everybody orders at once there is going to be grave congestion, and it is better to pursue a waiting policy; fifth, everybody should burn wood; sixth, everybody should burn peat; and so on, to the length of the formal subdivisions of an old-fashioned sermon.

If there is to be any grave shortage of coal in spite of the best efforts of the Railway Administration, the obvious step is to devote the supply to essential and not to inconsequential purposes. The people must be provided with fuel enough to keep them warm, and industries necessary in the prosecution of the war must be kept running at full output. The perpetual attempt to shuffle and compromise in the matter of needless business should be stopped without further procrastination. There is not one man or woman now engaged in producing articles of luxury or of purely fanciful value who cannot find a job, generally at higher wages, in the

production of necessities; and their present employers have had ample notice served on them to shift the line of their activities without wasting time about it. Their pocket nerves may suffer serious twinges, but they will sacrifice far less than will the million facing the Hun abroad. War industries must run, and the power stations that are supplying them should never fail them. To-day electric light and power must be ranked squarely as a necessity, and the supply stations must be kept going, with the sole qualification that their useless load should be suspended or transferred to useful purposes. It is time to begin a reform right now, in a definite and systematic program which shall leave no questions of dubious bearing to hinder useful applications. It is the present uncertainty which is the chief source of trouble, a hindrance to every industry that requires power. We need a determined policy, vigorously enforced without respect for the feelings of those who are not actually helping on the war. The electrical supply companies of this country are perfectly willing patriotically to endure their share of whatever sacrifices may be necessary, but they have a right to know the extent of these sacrifices, and that they are made for the benefit of the government's great purpose and not to save the skins of those who are adding nothing to the strength of the country's fighting arm.

Studying Electrical Distributions on Models

AT THE time when copper was cheap and plentiful almost every operating company in the country had considerable amounts of spare copper in its transmission and distributing lines, partly anticipating future expansion and partly as a result of poor or careless engineering. The times have changed, and many an operating engineer is spending sleepless nights figuring out how to redistribute the little available copper to the best advantage. All kinds of tie lines are being projected in order to relieve the overloaded feeders by making other feeders carry part of their load. In this connection a number of interesting theoretical problems arise concerning the distribution of currents in complicated networks. Theoretically speaking, any network problem can be solved by writing a sufficient number of Kirchoff's equations, but when one has to do with alternating currents these equations must be interpreted vectorially and the solutions sometimes lead to complicated equations of higher order. We mentioned such a problem in the Research Section of May 18, and some similar problems have recently come to our attention.

What is needed is some ingenious mechanical device or a slide rule to enable one to determine without much trouble the distribution of currents and voltages in comparatively complicated alternating-current networks. In the meanwhile the easiest solution in the present emergency seems to be to use laboratory models of the actual distribution, with both the currents and the voltages reduced in some convenient ratio. Older electrical engineers will remember that such model distributions were used in the early days of planning of the Edison system in large cities when the designer wanted to be "on the safe side" and did not trust his knowledge of Ohm's law. We are now reckless enough to design plain feeders without checking their performance on a laboratory model, but we need not be ashamed in the present emergency to connect up a few resistors and choke coils in the laboratory and to find out empirically the best place for a tie line or the amount of relief which an available tie line might bring about.

This experimental method seems to possess further possibilities well worth looking into. Take, for example, the case of several banked transformers connected in parallel to a secondary distributing line. The number of such transformers is usually selected in such a way as to give an uninterrupted service to all the customers with one or more transformers out, and it becomes rather a complicated mathematical problem to determine the new distribution of the load under some assumed abnormal conditions. A suitable laboratory model would enable a practical man to try different positions of transformers and different combinations of disabled ones until the most satisfactory and economical arrangement is found. Another case is that of induction motor design. It is well known that an induction motor may be represented by an equivalent electric diagram consisting of resistances and reactances. A designer who has a set of adjustable resistances and choke coils can readily check his design, or he can find by means of a few trial tests the values of these quantities which give him a desired power factor, slip, overload capacity, etc. Taking it altogether, the empirical experimental method of dealing with complicated circuits by means of models deserves more attention than it has received heretofore.

The Use of Iron and Steel Conductors

THE high cost of copper and the increasing amount of long, rather lightly loaded lines have combined greatly to stimulate the use of iron conductors for transmission systems. The sole material objection to this practice is the obvious one that for alternating-current work, the only thing here worth considering, the equivalent resistance of the wire is affected by both frequency and the magnetic properties of the conductor. There is a certain rather small genuine increase of resistance due to the skin effect. There are hysteretic and eddy-current losses and the inconvenience of reactance drop, in part a function of the permeability. The practical properties of iron and steel as electrical conductors are thoroughly discussed in the paper by C. E. Oakes and P. A. B. Sahm of the Bureau of Standards in our current issue, and the information given will be found of material service by those who have occasion to plan extensions with iron or steel wire.

To begin with, the properties of such wire are subject to a good deal of practical variation. The electrical, mechanical and magnetic qualities vary considerably, more widely than any of the standard properties of copper wire, so that extreme precision in calculations cannot be realized from the data usually available. Hence it is practicable to base working data on rather simple formulas. The authors show that within moderate limiting values of the current the effective equivalent resistance of an iron wire may be practically expressed as a linear function of the current, and the tables which

they give make the resistance easily available. Likewise, within limits the variations in reactance can be approximately expressed by a simple linear equation easily applied. The data given apply to the usual 60-cycle circuits, which are now practically the only ones likely to be equipped with iron conductors. An additional very convenient table gives the external reactances for iron and steel wires. This external reactance is in no way connected with the material of the wire, but the usual tables give only the data for the standard copper-wire sizes. Going on from this, the writers take up the question of charging currents for the usual iron-wire sizes. These again are independent of the material of the wire, but in an iron line wherein the economical current-carrying capacity is rather low, only about 1 amp. per 10,000 circ. mils, the charging current may be a very appreciable part of the total, even in comparatively short circuits. The data given are quite sufficient for the electrical design of any iron-wire line that is likely to be encountered in practice, and their assembling into this compact and convenient form should be of great service to the increasing number of engineers who have to consider iron-wire construction as a necessary part of minor distribution.

Motors in the Newburgh Shipyards

SOME notes elsewhere in our columns will prove useful to the many engineers who have to struggle with emergency conditions due to the war. The Newburgh shipyard is one of the plants pushed into service within the last year and about to launch its first ships. The question of power in such a plant is a very serious one, and the designers were fortunate in having central-station power on which to fall back, thus getting rid of all the uncomfortable problems of an isolated plant, to say nothing of saving money. The notable thing about the equipment is that it is a rather complete adaptation of individual motor drive with belted motors. Recent practice has drifted very rapidly in the direction of direct-connected or geared motors, but here there had to be faced the absolute certainty that no prompt deliveries of equipment of this kind could be obtained and the only thing to do was to get thoroughly good and reliable standard motors and use them.

Under stress of the same conditions the entire equipment is with constant-speed motors, save for the furnace blower and the bending rolls. Here installation of variable-speed motors was imperatively necessary. Moreover, the standard motors, in virtue of their being belted to the work, served the purpose for which, except for time of deliveries, special high-starting-torque motors would have been used. It was anticipated and actually found that the belt slip at the start was just enough to ease off the starting conditions, even on heavy machinery with considerable flywheel effect, so that substantially the entire plant is operated by ordinary squirrel-cage motors with auto starters, and the whole outfit has given excellent service. It is a capital example of making good with what one can get, instead of grumbling over the unattainable.

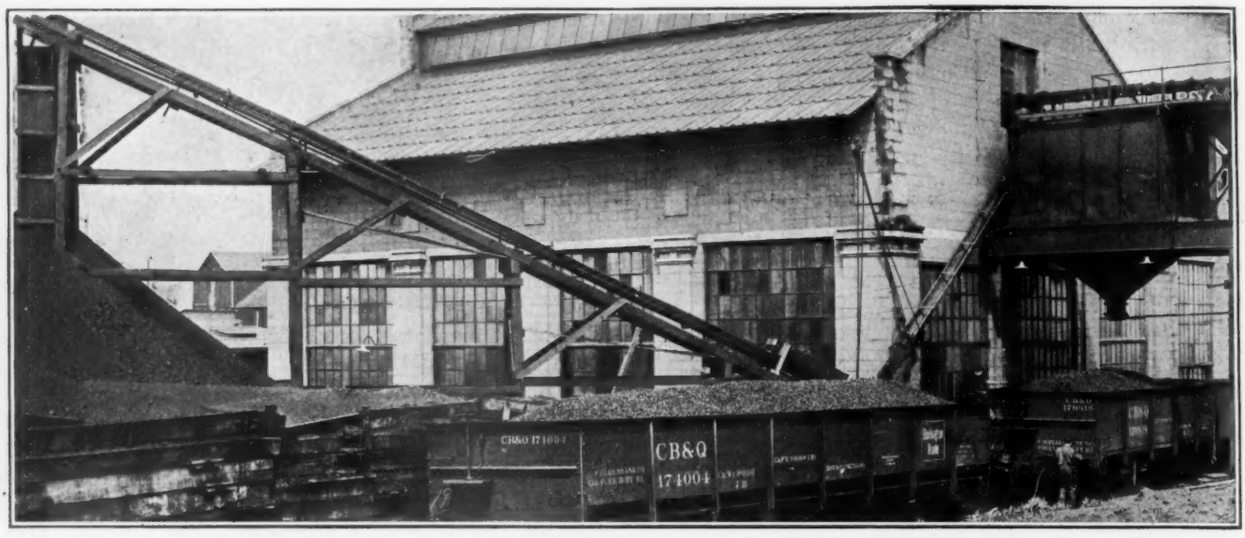
Co-operative Movement on the Pacific Coast

ONE of the latest plans for bringing the industry together is outlined by S. M. Kennedy in this issue. Like much that is done on the Pacific Coast, the scheme is as original as it is frank, for there they call a spade a spade. The essence of the whole campaign is to let each man see the other side of the page, the side the other fellow is familiar with; then, after looking outward at the other man's problems and troubles, each man can better look inward and see where he falls short and where he can help himself by helping the other fellow. Although co-operation is the impelling motive, it is taken for granted that each branch of the industry will sustain itself and not fatten on some other branch's efforts.

A great poet has said, "They also serve who only stand and wait," but that saying most certainly does not apply to the electric business. If the central station builds generating plants and distribution lines and only stands and waits for a load, it never will get it. If a dealer opens a shop and puts in an inconsequential stock, poorly displayed, and only stands and waits for customers, he never will have a paying business. The essence of the electrical business is action. Each of the branches of the industry has its function, but if one branch does not do its whole part, then the work must be carried on by another branch. There was a time when the central station not only generated and distributed energy but also was manufacturer, jobber, contractor and dealer. This condition was not the central station's own seeking, but was the outcome of necessity. Gradually conditions changed, and others took up much of the work the central stations had been compelled to do. To-day the average central station desires only to manufacture the energy it distributes. It is in no sense a jobber or a contractor or a dealer in merchandise. But the central station must have a load, and this load must be sought and built up. It cannot stand and wait for the load to come. The work has been started and must be continued. The central station is not only willing but anxious to pass the work of load-building on to others in so far as it pertains to merchandising, but the others who take it up most demonstrate their ability to do it.

The Coming Issues

ANOTHER article on iron wire will be printed soon in the ELECTRICAL WORLD which should be of interest to engineers who are trying to get along with less expensive line construction. It will dwell on the sags permissible with iron wire and with means of still further decreasing iron-wire construction costs. The second installment of Professor Clewell's article on motor drive in paper and pulp mills (Part I appears in this issue) will refer to adjustable-speed motor applications, the operation of Jordan engines, calenders and platers, and to the control of various machines used in this industry. Features of a recently completed hydroelectric station, plant construction costs and the results of an investigation to determine the heating of conductors under different conditions will form the basis of other articles.



Storing Coal in a Small Plant

Description of Method Used in a Medium-Size Plant Where a Flexible System of Portable Conveyors Is Tied in with Coal-Handling Equipment—Circular System of Piling Adopted—Estimated Cost of Storing and Reclaiming, 20 Cents per Ton

OWING to war conditions coal storage has become of unusual importance, and if instructions are followed, more coal will be stored this summer than ever before in the history of the country. As a war expedient storage has become necessary, and there are reasons why the present movement should continue in normal times. Equalization of the transportation problem—that is, moving as much of the coal as possible in the spring and summer instead of in the fall months, when the railway equipment is needed for handling crops, or in the winter, when the cost of operation is greatest—and the extension of the working mining period from two-thirds to a normal business year should result in a reduction in charges that would practically balance the cost of storage. These are possibilities of the future. To meet the present emergency coal is being stored in numerous ways and by a wide variety of equipment. An account of what has been done at the educational institution conducted by the Loyal Order of Moose at Mooseheart, Ill., and the proposed extensions for the coming summer may be of interest.

About 8500 tons of coal—1¼-in. (3.18-cm.) Franklin County nut and ¾-in. (1.9-cm.) screenings—was burned last year. With the increasing demands on the plant it is expected that the annual coal consumption for the coming year will be approximately 11,000 tons.

Storage was begun in the summer of 1917, as some of the difficulties of obtaining an adequate supply of fuel were already anticipated at that time. Coal was received in a track hopper and elevated by a continuous conveyor, as usual, but, instead of being delivered to a 40-ton overhead bunker in the station, was discharged through a chute into a semi-portable conveyor used to stack the fuel in a pile. The conveyor is of the Barber-Greene type, is 60 ft. (18.3 m.) long, has an 18-in. (45.7-cm.) four-ply canvas belt and is driven by a 5-hp. motor mounted on one end of the frame. When uniformly loaded the conveyor has a capacity of 40 tons per hour and operates at an angle of 25 deg. with the horizontal.

In order to get 3000 tons on one pile the coal was pulled back from the conveyor by an improvised scraper operated by a 7½-hp. gasoline engine through a drum and 200 ft. (61 m.) of ⅝-in. (15.9-mm.) cable. A rope attached to the back of the scraper and passing around a pulley on the opposite side of the pile was used to pull the scraper back to the starting position. The loose end of the rope was brought back to the engine and, with the drum thrown out of gear, was given a half hitch around the capstan, so that the engine did the work. To perform this operation three men were required—one to handle the scraper, one to operate the engine and the third to place the rope on the capstan. During the coming season reclaiming will be effected by laying the semi-portable conveyor flat on the ground, turning it end for end and directing it to discharge the coal shoveled onto it from the pile into the railway track hopper, the plant conveyor then handling the fuel as usual.

With so much rehandling of coal, storage proved rather expensive last summer, the labor cost for storing and reclaiming exceeding 40 cents per ton. In addition, fires developed and a great deal of shifting with the scraper had to be done before they could be brought under control. However, the first summer of storage was profitable in that several things to be avoided were learned by experience. For example, water pockets were left in the pile by using the scraper, thus helping to disintegrate the coal; furthermore, the screenings were stored with the nut coal, producing an ideal condition for spontaneous combustion, since the fine coal fills the interstices beween lumps, shuting off the circulation of air. When piled in alternate layers as the coal would be in this case, conditions are more unfavorable, as the

coarse coal would allow sufficient air to get through to feed a fire in the fine coal but not enough to keep down the temperature.

Trouble was also experienced from using a retaining wall of planks around the pile of coal. Fires started in several places around the outside and near the bottom of the pile, first being observed around the boards supporting the retaining wall. Eventually they caught fire and had to be removed. The scraper was used to work over the pile in an effort to remove the burning coal, and it had to be retained in service nearly all summer. To ventilate and cool the coal, perforated iron pipes were driven down into the pile, but the only effect they seemed to have was to furnish enough air to burn the coal immediately surrounding the pipes.

This year the storage piles will be smaller and arranged so that burning coal may be readily removed. There will be no extraneous matter in the coal, such as wood or oily waste, to precipitate a fire, and an effort will be made to pile separately the screenings and the lump or nut coal. The proposed layout is shown here. It may be noticed that a portable conveyor mounted on an adjustable two-wheel truck and a pivoted chute connecting it with the semi-portable conveyor installed in 1917 has been added to the equipment. The portable conveyor has a four-ply endless rubber belt 18 in. (45.7 cm.) wide and 51 ft. (15.5 m.) long between pulley centers. The capacity is the same as that of the other conveyor, and the driving force is supplied by a 5-hp. motor mounted in the frame.

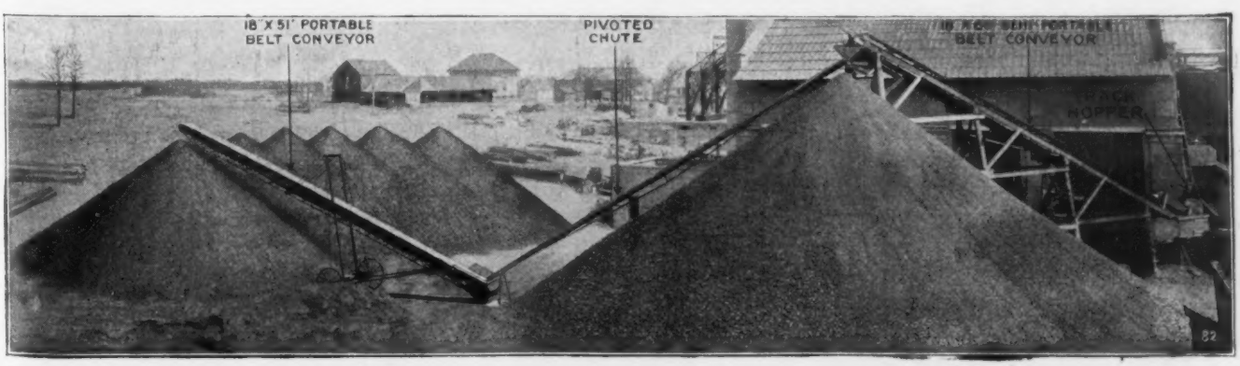
In storing the coal this summer the central pile fed by the semi-portable conveyor will be allowed to assume its natural angle of repose, about 40 deg. There will be no scraping back from the conveyor. With the apex 30 ft. (9.1 m.) above the base the pile will contain approximately 960 tons of coal. With the end of the semi-portable conveyor as a center, the coal will then be stored in a circular pile—or, rather, series of piles—around the central storage by means of the connecting chute and the portable conveyor shown. The limitations of the property allow an arc of 180 deg. for the outside pile. Its dimensions will be about 46 ft. (14 m.) wide and 19 ft. (5.8 m.) high to the apex, and the storage about 3000 tons. With the layout previously described heating of the coal will present no serious difficulty, since burning coal can be removed at any point with facility.

As it is the intention to store as much of the coal consumed annually as it is possible to obtain, a similar system will be started on the opposite side of the coal spur, where there is room for a complete outside circular pile, giving an additional storage of 6000 tons. In this case it will be necessary to lengthen the semi-portable conveyor from 60 ft. to 132 ft. (18.3 m. to 40.2 m.) and use a 7½-hp. motor to drive it. The belt is spliced with alligator lacing so that the additional length can be inserted without cutting the belt, and the required number of sections can be added easily to the frame.

Reclaiming from the central piles will be effected by leveling the semi-portable conveyor, turning it end for end and shoveling coal onto it from the pile. From the circular pile the coal will be shoveled onto the portable conveyor, discharged onto the semi-portable outfit and delivered into the track hopper, from which the power plant equipment will elevate it to the overhead bunkers. A self-loader, in reducing the labor requirements, would lessen the cost of reclaiming the coal, and it is possible that such an apparatus may be used.

Flexibility and comparative cheapness are the outstanding features of the equipment which has been described. The initial cost was close to $2,000. With the equipment out in the open an allowance for depreciation and upkeep of 15 to 20 per cent should be conservative for the frame. A commonly accepted figure chargeable to belt wear is 0.5 cent to 1 cent per ton of coal handled. Interest on the investment may be placed at 6 per cent. The unit fixed cost per year will depend upon the amount of coal stored. An estimate is given below for 6000 tons, although with the present layout and equipment there is room for 10,000 tons of coal. Depreciation and upkeep on the frames of the conveyors at 20 per cent will amount to $200, the belts forming about half of the investment or 3⅓ cents per ton. Belt wear at 1 cent per ton will total $60, and interest at 6 per cent on $2,000 will amount to $120. The total fixed charges per year will then be $380, reducing, on the basis of 6000 tons, to 6⅓ cents per ton.

The operating charges depend upon the power-plant facilities for receiving coal, which are limited to three cars per day of eight hours, or 120 tons. In storing coal two men at $3.50 per day will be required. The labor charge reduces to 6 cents per ton. In reclaiming three men at $3.50 per day will be used, and each can readily shovel 5 tons per day, so that the cost is 7 cents per ton. A self-loader having a capacity of 25 tons per hour and costing about $1,000 would reduce this figure. The cost of power, grease, etc., will be slight, so that storing and reclaiming of the coal should cost close to 20 cents per ton. This figure does not include the cost of running the power-plant conveyor when storing the coal, so that the total cost will be slightly in excess of the above amount. Even then the cost is low considering the tonnage. It is a good indication of what may be done in a small plant.



Characteristics of Iron and Steel Conductors—I

The Use of Iron and Steel for Transmission Conductors Has Been Greatly Stimulated by War Emergencies—Complete Test Data for Calculation of Electrical Characteristics Now Available

BY CHARLES E. OAKES AND P. A. B. SAHM
Bureau of Standards, Washington, D. C.

THE practice of using iron or steel wire or cable for extensions to electrical supply systems where the load to be connected is small and often comparatively distant has been increasing during the past year. The extent of its use is not generally realized. From time to time short articles have appeared in the technical press giving the characteristics of certain sizes and kinds of wire used in particular cases with which the author concerned has had experience. This article is a symposium of what has appeared on the electrical characteristics of such wire. A second article follows with a large amount of new material on the mechanical characteristics arranged so that it may be either copied or made available in the form of curves to suit the convenience of the reader.

TABLE I—ALTERNATING-CURRENT RESISTANCES OF A SINGLE CONDUCTOR IRON WIRE AT 60 CYCLES IN OHMS PER MILE
$R = a + I_r b$

Size	Range of Current (Amperes)	a	b
Seven-strand nominal diameter:			
½-in. ordinary grade steel	0—20	5.0	0.016
5/16-in. E. B. B.	0—6	4.3	0.066
	6—10	3.4	0.22
5/16-in. B. B.	0—10	5.25	0.035
	10—15	4.7	0.094
5/16-in. ordinary grade steel	0—10	5.5	0.045
	10—14	5.3	0.064
5/16-in. Siemens-Martin	0—20	7.1	0.007
½-in. E. B. B.	0—6	7.8	0.07
	6—12	7.2	0.171
	12—16	6.2	0.262
½-in. ordinary grade steel	0—5	8.82	0.032
	5—16	9.5	0.094
½-in. Siemens-Martin	0—10	9.2	0.03
	10—16	8.8	0.072
Solid B. W. G.:			
No. 4 E. B. B.	0—6	6.2	1.27
	6—10	8.2	1.14
No. 4 B. B.	0—2	7.1	6.5
	2—7	6.3	1.06
	7—9	8.5	0.7
No. 6 E. B. B.	0—5	8.0	1.88
	5—7	12	1.1
	7—13	20	0
No. 6 B. B.	0—7	8.7	1.25

The resistance of a conductor carrying an alternating current is affected by the frequency and by the magnetic properties of the conductor. For iron and steel wires the resistance is increased by the combined action of skin effect and the increase in permeability. Hysteresis and eddy-current losses also contribute to the effective resistance of the wire. The effective resistance is a function of all these factors and has a value such that when multiplied by the square of the current it will give the power loss in the line.

The resistance of a wire of given size and material will vary through a wide range for samples taken as representative for several heats. The processes used in the fabrication of the wire are such that the electrical properties vary over an appreciable range. If curves of current against resistance are plotted for a number of samples of wire of similar physical characteristics, it will be found that there will be a variation in the resistance of the several samples in some cases as great as 5 per cent from the average. For this reason a high degree of accuracy in calculations is not warranted. Such curves follow no simple mathematical law, but for practical purposes averages of a large number of tests will be made available by the following procedure.

Between certain specified limiting values of current the effective resistance of an iron wire may be expressed as a function of the current. This expression will be of the form:

$$R = a + I_r b \qquad (1)$$

where I_r is the load current and R is the alternating-current resistance in ohms per mile of conductor at 60 cycles; a is the intercept of the straight line for the current range under consideration on the R-axis and is given in Table I; b is a constant for the current range under consideration and is given in Table I. It is the tangent of the angle which the assumed straight line makes with the I_r axis. This expression assumes a straight-line law between current and resistance for specified limits of current.

TABLE II—INTERNAL INDUCTIVE REACTANCES OF SINGLE CONDUCTOR AT 60 CYCLES IN OHMS PER MILE
$X_i = c + I_r d$

Size	Range of Current (Amperes)	c	d
Seven-strand, nominal diameter:			
½-in. ordinary grade steel	0—5	0	1.2
	5—20	1.1	0.026
5/16-in. E. B. B.	0—3	0	1.25
	3—6	0.5	0.25
	6—10	1.3	0.12
	10—14	3	—0.05
5/16-in. B. B.	0—7	0	1.3
	7—16	0.6	0.106
5/16-in. ordinary grade steel	0—2	0	0.36
	2—20	0.16	0.055
5/16-in. Siemens-Martin	0—20	0	0.04
½-in. E. B. B.	0—5	0	0.45
	5—12	1.2	1.79
	12—18	0.6	2.28
½-in. ordinary grade steel	0—5	0	1.2
	5—12	0.5	1.44
½-in. Siemens-Martin	0—1.7	0	1.3
	1.7—8	1.2	0.05
	8—16	0.8	0.1
Solid B. W. G.:			
No. 4 E. B. B.	2—10	5.6	0.24
No. 4 B. B.	0—1	0	3.4
	1—2	1.6	1.75
	2—3	2.8	1.13
	3—5	3.7	0.82
	5—7	5.2	0.52
	7—10	6.95	0.275
No. 6 E. B. B.	0—1	0	6
	1—2	3.4	2.6
	2—4	6.7	0.95
	4—8	10.2	0.01
	8—12	13	—0.266

The power loss, neglecting that due to charging current (in this case the load current becomes the line current), may be expressed as follows:

$$P_l = I_r^2(a + I_r b)l \qquad (2)$$

The current may be expressed in terms of the power de-

livered, P, and the voltage at the receiver, E, as follows:

$$I_r = P/(E\cos\theta), \qquad (3)$$

from which

$$P_r = (laP^2)/(E^2\cos^2\theta) + (blP^2)/(E^2\cos^2\theta) \qquad (4)$$

where P_r is the power loss per conductor; P is the power delivered; a and b can be obtained for the wire and current under consideration in Table I; l is the length in miles of one conductor of the line and cos θ is the power factor of the load. The power loss due to the charging current is considered later.

The reactance of a magnetic conductor is made up of two factors—the external reactance, which may be calculated when the physical dimensions of the circuit in air are known, and the internal reactance, which is a function of the permeability. The internal reactance of iron and steel wires of like dimensions and of similar physical properties is subject to variation over a considerable range in much the same manner as the resistance. The internal reactance may be expressed by an equation of the form $X_i = c + I_r d$, where X_i is the internal reactance in ohms per mile of conductor at 60 cycles.

As in the case of resistance data a straight-line law is assumed between specified limits of current. In this equation c is the intercept on the X_i axis for the current under consideration and is given in Table II; d is a constant for the current range under consideration and is also given in Table II.

Tables I and II are the result of the assembly in the form indicated above of all the available curves of resistance and internal reactance for iron and steel wires which have appeared in the technical press. Special attention is called to the fact that they apply only to 60-cycle circuits. As the external inductive reactances are not generally available in the sizes of wires which are used in the fabrication of steel and iron wire into cables, Table III has been computed and is similar to tables appearing in the hand books for other sizes of wires. It is perfectly obvious that, since the external reactance is not a function of the material of the wire, this table can be used for all grades (B. B., E. B. B., ordinary steel and Siemens-Martin), whereas for the internal inductive reactance the grades must be distinguished from each other and listed under a given size, as has been done in Table II.

Since the most economical current-carrying capacity which can be used for iron or steel wire is in the neighborhood of 1 amp. per 10,000 circ. mils, transmission of large currents is not economically permissible. The charging current is therefore no mean factor and must be taken account of in the consideration of transmission losses. Even in comparatively short lines the capacity current is an appreciable part of the total current.

If it be assumed that one-half of the capacity current of the line flows to the receiving end, which is usually justified for the transmission distances which will be encountered in practice, the line current becomes:

$$I^2_l = [I_r \sin\theta - (I_c/2)]^2 + I_r^2\cos^2\theta \qquad (5)$$

where I_l = the line current, corresponding to I_r in equations (1) and (2), I_r = load current, I_c = capacity current, cosθ = load power factor.

Substituting $P/E\cos\theta$ for I_r, the following is obtained:

$$I_l^2 = [(P/E)\tan\theta - (I_c/2)]^2 + P^2/E^2 \qquad (6)$$

in which P and E have the same significance as above. The power loss is:

$$P_r = I_l^2\,(a + I_l b)l \qquad (7)$$

A table of charging currents is given in Table IV for the various sizes of wire concerned herein.

The charging current is of course not dependent on the material of the wire used and is thus identical with the charging current which would be obtained with copper wire of the same cross-section. The fact that the capacity current in the longer lines is necessarily a large per cent of the total current which it is economically feasible to use results in poor voltage regulation.

TABLE III—EXTERNAL INDUCTIVE REACTANCE OF A SINGLE CONDUCTOR AT 60 CYCLES IN OHMS PER MILE

From formula $X = 2\pi f \times 740.5 \log 2D/d \times 10^{-6}$ for solid conductors and $X = 2\pi f\,(91.8 + 741.13 \log 2D/d)\ 10^{-6}$ for stranded conductors.

Size	Spacing—Inches										
Stranded, Nominal Diameter, In.	12	18	24	36	48	60	72	84	96	108	120
¼	0.421	0.470	0.505	0.554	0.589	0.616	0.639	0.657	0.673	0.688	0.701
5/16	0.434	0.483	0.518	0.568	0.599	0.630	0.652	0.670	0.686	0.701	0.710
⅜	0.460	0.509	0.544	0.593	0.628	0.655	0.678	0.696	0.712	0.726	0.739
7/16	0.471	0.521	0.555	0.604	0.639	0.667	0.689	0.708	0.723	0.738	0.751
½	0.504	0.554	0.589	0.638	0.672	0.700	0.722	0.740	0.754	0.763	0.781
Solid B. W. G.:											
No. 4	0.560	0.609	0.644	0.694	0.728	0.755	0.778	0.796	0.814	0.826	0.840
No. 6	0.579	0.629	0.664	0.713	0.747	0.775	0.798	0.815	0.831	0.846	0.858
No. 8	0.605	0.654	0.688	0.737	0.773	0.801	0.823	0.840	0.857	0.870	0.885
No. 10	0.630	0.679	0.713	0.763	0.798	0.825	0.847	0.865	0.882	0.896	0.909
No. 12	0.654	0.704	0.740	0.787	0.824	0.850	0.873	0.891	0.908	0.92	0.930

TABLE IV—CHARGING CURRENT IN A SINGLE WIRE PER 100,000 VOLTS AT 60 CYCLES IN AMPERES PER MILE, FROM PHASE WIRE TO NEUTRAL

From formula $I = (2\pi f \times 38.88 \times 10^{-9}) / [\log_{10}(2D/d - d/2D)]$

Size	Spacing—Inches										
Stranded, Nominal Diameter, In.	12	18	24	36	48	60	72	84	96	108	120
¼	1.041	0.925	0.858	0.775	0.730	0.695	0.67	0.65	0.634	0.621	0.609
5/16	0.83	0.755	0.708	0.652	0.618	0.593	0.574	0.560	0.548	0.537	0.528
⅜	0.948	0.853	0.783	0.724	0.681	0.652	0.63	0.618	0.598	0.586	0.574
7/16	0.772	0.706	0.665	0.615	0.584	0.563	0.546	0.533	0.522	0.512	0.504
½	0.72	0.662	0.627	0.582	0.555	0.535	0.520	0.508	0.497	0.489	0.482
Solid B. W. G.:											
No. 4	0.730	0.673	0.635	0.590	0.562	0.542	0.526	0.514	0.503	0.496	0.487
No. 6	0.707	0.651	0.618	0.574	0.548	0.528	0.514	0.502	0.492	0.484	0.477
No. 8	0.677	0.627	0.594	0.555	0.530	0.511	0.498	0.487	0.477	0.470	0.463
No. 10	0.650	0.602	0.574	0.536	0.513	0.496	0.483	0.473	0.464	0.456	0.450
No. 12	0.6225	0.578	0.550	0.516	0.4935	0.4778	0.466	0.456	0.448	0.442	0.436

It is none too early for the American business man to begin thinking of these ships in terms of modern delivery service to foreign customers. And not the business man alone, but the farmer, the consumer, the community—the whole American nation. We must get ships into our thinking and planning and work, just as we have got railroads into the American consciousness. When the war ends, there will be work for ships all over the world.—*Edward N. Hurley, Chairman United States Shipping Board.*

Motor Drive in Paper and Pulp Mills—I

Important Applications, Particularly Beaters and Grinders—Variations in Power Requirements —Examples of Group and Individual Drive, Showing Type of Installation That Has Worked Out Well in These Plants

BY C. E. CLEWELL
Assistant Professor of Electrical Engineering, University of Pennsylvania

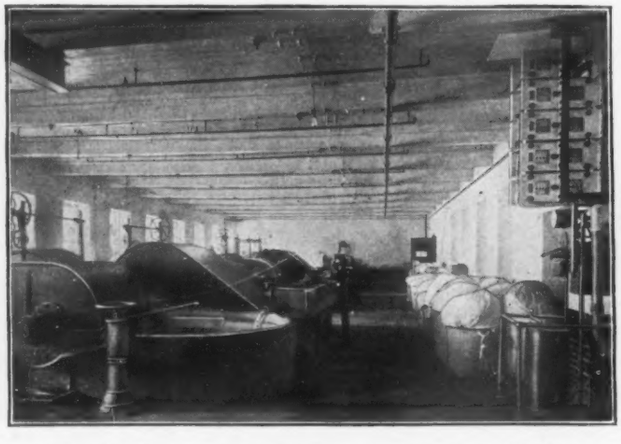
ONE of the most interesting applications of power through the medium of the motor is that of the various machines employed in the manufacture of paper. This is true partly because of the numerous kinds of machinery found in such plants and also on account of the heavy torque requirements imposed on the driving motor by certain classes of the equipment, which have called for the particular attention of motor manufacturers in the design of motors and control apparatus to suit given conditions. It is estimated that roughly 300,000 hp. has been installed in the form of motors in this field alone—a fact which indicates that the motor has satisfactorily filled the operating requirements of a great deal of the pulp and paper mill machinery involved.

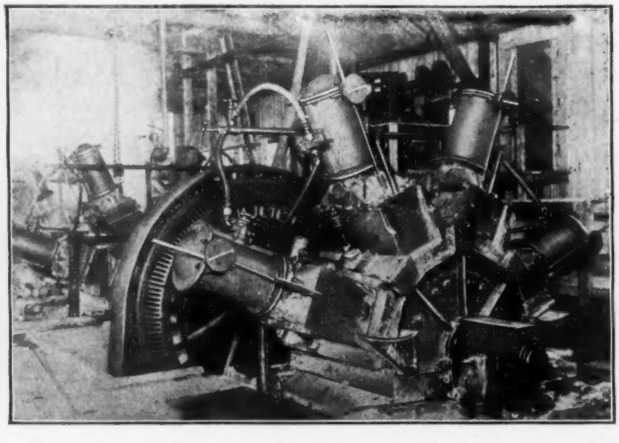
Even a casual survey of the reasons for the widespread adoption of motors in these mills shows that the fundamental advantages of electric drive have been largely responsible for its acceptance by the paper industry. Among the prominent benefits afforded by electric drive is the flexible distribution of power which permits arranging the machinery more or less independently from the standpoint of the power supply; furthermore, a distinct opportunity for realizing highly efficient production is permitted through the study of the duty cycle of special machines and the selection and use of a motor best suited to meet their requirements.

One of the obstacles to a good perspective of the operations conducted in paper and pulp mills is the lack of familiarity concerning the manufacturing processes involved. While it is outside of the range of this article to go into the details of these operations, references will be made throughout the discussion to specific machines. As is usually the case in other industries, quite a number of appliances are found in the average paper and pulp mills which are in the nature of auxiliary apparatus and which are suited to operation by the motor. Among these are the elevators, water supply pumps, conveyors and exhaust fans. Other apparatus which is particularly identified with paper making has also been found to be especially adapted to motor drive; for example, beaters, grinders, Jordan engines, calenders, platers, screens (both flat and centrifugal), chippers and shredders, rotary boilers and digesters, pumps of the stuff, suction-box, white-water and effluent types, winders, re-winders and cutters, together with such machines as agitators, mixers, slushers and concentrators.[1]

From the foregoing list it is apparent that the types of machines suited to motor drive are both numerous and widely variable in their characteristics. Perhaps it is best, therefore, in a brief discussion of this kind to limit the treatment to a few representative machines, so it is proposed to confine the explanation of specific applications to beaters and grinders in this installment, with notes on the types of motors most widely used, and to point out characteristic arrangements of driving both for individual and for group methods of applying the motor. A subsequent installment will take up the important subject of control for paper and pulp mill motors and will outline some of the features connected with motor operation of Jordan engines, calenders and platers.

In a general way, the field may be said to include uses for both squirrel-cage and wound-rotor induction motors; for the adjustable-speed direct-current motor in special cases, some of which are described in the sec-





FIGS. 1 AND 2—SEVEN RAG BEATERS DRIVEN BY A 200-HP. SLIP-RING INDUCTION MOTOR; 1200-HP. INDIVIDUAL DRIVE MOTORS

[1]Based on tabulation of paper and pulp mill machinery for motor drive, by Joseph H. Wallace, "Standard Handbook for Electrical Engineers," fourth edition, p. 1271. Some reference has been made to this handbook section; also to a discussion by W. L. Merrill, *Transactions A. I. E. E.*, Vol. 36, Part I, p. 1340, particularly in the discussion of motor types, and to an excellent summary of motor uses throughout this industry in an article by W. W. Cronkhite, *General Electric Review*, May 1917, p. 384, in particular the notes on beaters and grinders.

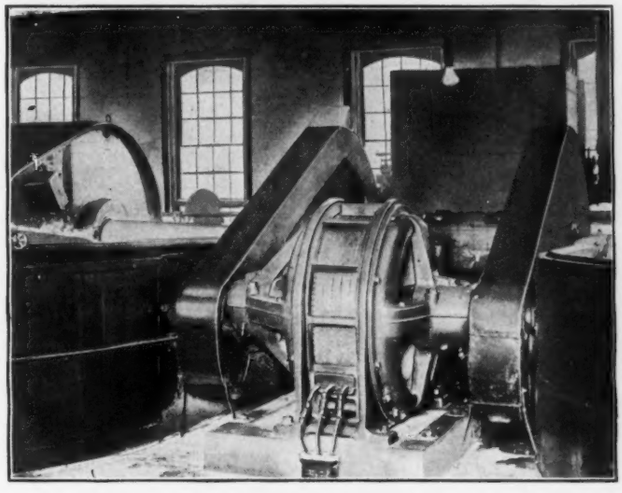
ond installment of this article, and for the synchronous motor. The accompanying Table I furnishes a convenient basis for a study of the machinery best suited to each type.[2] A glance at this table shows the prominent place held by induction motors of the squirrel-cage and wound-rotor types and the few special cases where the direct-current motor is employed in the ordinary practice.

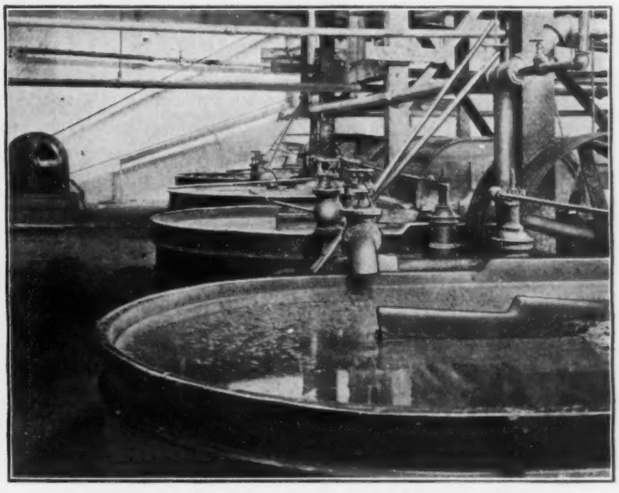
As a matter of fact Wallace[1] classes the polyphase induction motor as best for all types of paper and pulp machinery which operate at constant speed, but emphasizes the importance of the direct-current adjustable-speed motor in those cases where a number of different speeds are required and where steady acceleration is a necessity for the best results in starting. The lower first cost and operating expense and the greater dependability of the induction motor make it a desirable unit wherever its characteristics are suitable. The synchronous motor is sometimes utilized in a few special cases (see Table I) for purposes of power-factor correction, but only in cases where the starting effort required is within the range for which such motors are designed.

Because of the constant-speed characteristics of the squirrel-cage motor and its tendency to draw an excessive line current at starting, with consequent line voltage fluctuations, it is not practicable to employ this type in paper and pulp mill machines where speed changes are required. Its use is also limited by special starting requirements, as where slow starting and a necessity for coaxing the load are essential. The relatively rigid connection of motor and machinery where chain drive is used may also impose a hammer-blow effect at starting sufficient to make this type of motor objectionable. The utilization of belts will minimize this difficulty.

The two types of auxiliary or extra-resistance induction motors fall either into the class of internal variable-resistance motors or under the collector-ring type. Owing to physical limits to the amount of internal resistance which can be used, the first type of motor is essentially a constant-speed unit. The ability to start gradually is one of its chief advantages. It may be used for low-inertia loads and is recommended for the operation of groups of machinery in certain departments of the mill. (See Table I.)

The collector-ring or standard wound-rotor type has the characteristic of high starting torque, and when the control is properly designed it may be used for coaxing along a jammed load with several starts. This is a feature which is fairly common in certain pulp-mill machines owing to the settling of stock between periods of operation, making it necessary to exert a very heavy effort to loosen the stock preparatory to starting the machine again. Where variable-speed operation is expected from this type of motor, due allowance must be made for the fact that the speed regulation may be poor for any given setting of the adjustable rotor resistance.





FIGS. 3 AND 4—ONE MOTOR DRIVING TWO PULP-MILL BEATERS; WOUND-ROTOR MOTOR DRIVING BEATERS THROUGH BELT AND SHAFT

As previously mentioned, the synchronous motor may be employed for a few special cases where power-factor correction is a desirable feature and where the starting requirements of the machine are low enough to come within the available torque of the motor, and where the starting current, which is similar to that of the induction motor, is given due consideration in its relation to the generating machinery capacity. For a discussion on the use of the synchronous motor in paper and pulp mills in connection with low pressure turbines, see reference to paper by W. L. Merrill in footnote 1.

The characteristics of the direct-current adjustable-speed motor are such as to meet a few special cases successfully. However, it will be apparent that higher voltages, and hence lower cost, for transmission and distribution circuits can be better realized through induction motors than with direct-current operation. Wallace gives 2200 volts as a common pressure for alternating-current motors rated at 75 hp. and more. For smaller alternating-current motors 440 and 550 volts are common. The absence of a commutator is a distinct operating advantage in paper mills.

The "Standard Handbook for Electrical Engineers" contains a summary of some interesting tests of paper and pulp mill machinery which bring out the extreme variations of the power required to operate given machines as the conditions change from time to time. One or two statements based on these tests are included here because of the light they throw upon the difficulty of a determination of exact power requirements of such

[2]Rearranged in alphabetical form, abridged and modified slightly on the basis of a tabulation by W. L. Merrill. See footnote 1.

machinery. For example, three tests were conducted on motor-driven Jordan engines, two on one machine at different times and the third test on a second machine of the same size. These tests show variations of the kilowatt input to the driving motor ranging from about 115 kw. in the first test to 135 in the second and to 240, as a maximum, in the third. A somewhat similar test on a group of so-called wet machines showed variations from 18 kw. to 36 kw. during their operation. The approximate power required for various paper-making machines can best be shown by a table, as in previous articles, this particular tabulation being due to J. H. Wallace.[1]

The arrangement of paper-mill motors with respect to the machinery to be driven depends, as usual in such work, upon a number of factors, one of which is

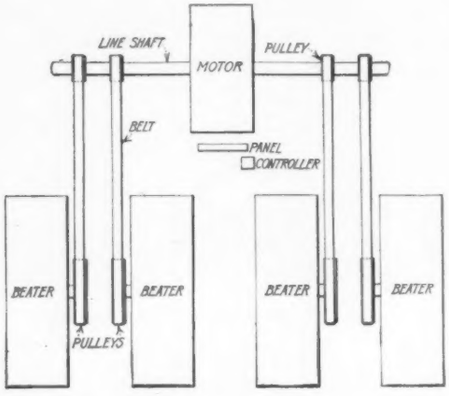


FIG. 5—METHOD OF DRIVING FOUR BEATERS BY ONE MOTOR

that of local conditions and another the general layout of the plant. Preference for individual motor drive seems to be general for the larger machines such as the grinder in the foreground of Fig. 2. In many cases, however, the machines are driven in groups from a given larger motor, or possibly in pairs of machines from each motor. Fig. 5 is a case of one large motor applied to four pulp-mill beaters, the machinery being arranged in pairs according to the power supply standpoint. Fig. 3 shows another way of driving pulp beaters, two being driven by one motor in this case.

An interesting case of group driving is shown in Fig. 1, which refers to a 200-hp. wound-rotor induction motor driving seven rag beaters. The individual method of motor drive is well illustrated by Fig. 2 for large machines, the motor being a 1200-hp. induction motor operating a group of eight pieces of paper and pulp mill machinery.

For purposes of specific discussion, the beater and grinder are selected as examples of motor applications in this industry, with other cases to be treated in the second installment of this article. The induction motor, and preefrably the wound-rotor type, is commonly used for the beaters, as in Figs. 1, 3 and 4. For grinders, one of which is shown in Fig. 2, both slip-ring induction and synchronous motors are employed with good results.

[1]Figs. 2, 3 and 4 are shown by courtesy of the General Electric Company; Fig. 5 is based on a somewhat similar diagram found on page 388 of W. W. Cronkhite's paper previously referred to, and Fig. 1 is due to the Westinghouse Electric Manufacturing Company.

Refinements in the application of the motor to such machinery, aside from the mere determination of horsepower and general type of motor, include consideration of the variations of torque required for various operations of the beater such as occur in washing pulps, beating and dumping, as well as the peaks of torque such as occur when the beater rolls are turned down. Tests

TABLE I—TYPES OF MACHINERY AND MOTORS FOR PAPER AND PULP MILLS

Name of Machinery	*Type of Motor for Individual Drive
Agitators	Induction, s.c. or i.r.
Band saws	Induction, s.r. (inclosed rings)
Barkers	Induction, s.c.
Beaters and washers	Induction, s.r. (often in pairs)
Centrifugal screens	Induction, s.r.
Chippers	Induction, s.r.
Circular saws	Induction, s.c., i.r. or s.r.
Deckers	Induction, s.c. or i.r. (in groups)
Flat-bed Screens:	
Groups	Induction, i.r., s.r. or synchronous
Individual	Induction, s.c.
Grinder lines	Induction, s.r. or synchronous
Heavy conveyors and log hauls	Induction, s.r.
Jordans, Marshalls and Clafins	Induction, s.c., i.r., s.r. or synchronous
Platers	Induction, s.c.
Pumps	Induction, s.c. or i.r.
Rag cutters, dusters and threshers	Induction, s.c.
Rotary boilers	Induction, s.c.
Rotary cutters	Induction, s.c. with mechanical speed change or d.-c. a.s.
Rotary furnaces	Induction, s.c.
Rotary screens	(No specific type given)
Sheet calenders	Induction, s.r.
Shredders	Induction, s.c. or s.r.
Silver screens	Induction, s.c.
Small conveyors	Induction, s.r.
Super-calenders	Induction, s.c. or d.-c. small motor, special large motor
Vertical cutters	Induction, s.c.
Wet machines	Induction, s.r.

* S.c. indicates squirrel cage; i.r., internal resistance; s.r., slip ring; a.s., adjustable speed.

under operating conditions show considerable variations of torque from a straight line during the process of beating, the peaks of which may, however, be relatively small in proportion to the average torque involved. The horsepower of beaters is sometimes based on the horsepower per inch width of face of the roll of the beater. Thus one value given is 1 hp. per inch width of beater-roll face. The actual requirements may be more or less than this, depending on the class of stock handled.

With the grinders (see Fig. 2) some attention is usually given to the lower average power required owing to irregularity in the time for filling pockets with

TABLE II—APPROXIMATE POWER REQUIREMENTS FOR PAPER-MAKING MACHINERY

Name of Machinery	Approximate Range of Hp. Required
Barkers	10 to 12
Beaters	30 to 75
Centrifugal screens	10 to 15
Chippers	75 to 100
Constand-speed line or pump line on paper machine	40 to 125
Crushers	25
Fourdrinier machines, variable-speed parts	50 to 400
Grinders	250 to 350
Jordan engines	50 to 300
Screens, flat-plate	4 to 6
Stuff pumps	5 to 10
Super-calenders	50 to 100
Wet machines	8 to 12

wood. The pressure employed in grinding and the speed employed are also factors which enter into the refinements of the application problem. Thus, there are differences of opinion as to the best speed to use for grinders, ranging approximately from 210 to 257 r.p.m. The importance of this single item is apparent at once when one considers that the rate of production as well as other inherent factors in the operation of such a machine depend, at least in part, upon the speed with which the operation is performed.

California's Electrical Co-operative Campaign

Outline of the First Year's Activities Carried On in That State for the Purpose of Developing Maximum Intelligent Distribution of Electrical Goods Throughout All Branches of the Industry

BY S. M. KENNEDY
General Agent Southern California Edison Company

PERHAPS no word in our language has been more overworked in recent years than the word "co-operation"—in fact, it has been used so much where it did not belong that, in a measure, it has begun to lose its meaning. On the Pacific Coast there have been some genuine efforts made in the past with only limited success to bring about a spirit of co-operation between the various branches of the electrical industry, and some attempts have been made, under the cloak of co-operation, to force through schemes which really spelled coercion. But in the movement in California to-day there is evidenced a spirit of genuine co-operation throughout the various divisions of the great electrical industry which promises to reach momentous and satisfactory proportions.

ORGANIZATION OF THE MOVEMENT

In April, 1917, there was held in Riverside, Cal., the first convention of the Pacific Coast Section of the National Electric Light Association. The Riverside convention went down in history as one which broke new ground in certain directions and did some original work before it adjourned. At that convention a resolution was adopted which read as follows:

"That the member companies of the Pacific Coast Section lend active co-operation and support to the California Association of Electrical Contractors and Dealers, and that a proposed plan be formulated by the commercial committee."

The members of the commercial committee later met representatives of the contractor-dealers and jobbers who stated that they already had formed certain ideas for the campaign and had raised a sum of money as a nucleus. Ultimately the commercial committee submitted a definite constructive and educational plan to the executive committee of the Pacific Coast Section, which plan after some changes and modifications was finally approved.

The first work was the appointing of a body to formulate and carry on the co-operative campaign. This body is called the advisory committee and consists of eight members—three central-station men, three contractor-dealers, one jobber and one manufacturer. This committee has done much constructive work, and its personnel is worthy of note. It is: Chairman, L. H. Newbert, manager commercial department Pacific Gas & Electric Company, San Francisco; vice-chairmen, G. E. Arbogast, F. E. Newberry Company, contractors, Los Angeles; G. B. McLean, assistant superintendent of sales, Southern California Edison Company, Los Angeles; A. E. Wishon, assistant general manager San Joaquin Light & Power Corporation, Fresno; R. M. Alvord, General Electric Company, San Francisco; D. E. Harris, sales manager Pacific States Electric Company, San Francisco; H. C. Reid, president California Association of Electrical Contractors and Dealers, San Francisco, and M. L. Scoby, Home Electrical, San Francisco.

The advisory committee has arranged to hold regular monthly meetings rotating between the three principal cities in the state, San Francisco, Fresno and Los Angeles. Members of the advisory committee hold unofficial weekly meetings in San Francisco and Los Angeles for informal discussion, and to these meetings are invited those interested in the co-operative movement who care to attend. Ideas gained at these discussions have been found invaluable, influencing in many instances the formal actions of the committee.

It was finally decided that a fund of $12,000 would be required to defray the expenses of the campaign for twelve months. This sum of money was cheerfully subscribed by the various interests, and proportioned so that 50 per cent came from central stations, 25 per cent from jobbers, 16⅔ per cent from contractor-dealers and 8⅓ per cent from manufacturers. The campaign expenses consist principally of salaries and traveling expenses of two field men and office expenses in the two cities, San Francisco in the north and Los Angeles in the south, from which offices the field men work. The field representatives selected are men of training who have in the past come in close contact with the contractor-dealer and the central-station officials, and who know something about the real and imaginary difficulties of the various branches of the industry.

OBJECTS OF THE CAMPAIGN

The aims of those in charge of the campaign may be characterized as simple but definite—simple because they do not involve methods that may be termed experimental, freaky or untried, and definite because the end looked for is a better understanding, through consistent and persistent educational endeavors, between the different branches of the electrical industry and between the individuals representing the different branches in various centers throughout the state. No attempts are being made to dictate to any individual or branch of the business what has to be done. No one part of the industry may say to one neighbor, "Thou shalt not!" or to another, "You must not!" and no one is threatened, intimidated or cajoled. On the other hand, every reasonable effort is being made to educate and inform each branch of the industry as to how its own particular business may be more efficiently handled, and a constant effort is made to assist each branch more intelligently to understand some of the problems and perplexities of the other branches. The campaign is not one of aggressive agitation but rather of progressive education. It is an appeal to the intelligence of the individual rather than an appeal to the old-time prejudices of any group. It is the crystallization of a desire to have each branch of the business recognize

the responsibilities it owes to the other branches of the industry and to teach the individual that, after all, he may to some extent still be "his brother's keeper."

Two field men have been appointed to carry on this educational work under the immediate direction of the advisory committee. For the more efficient handling of the campaign the state has been divided into two geographical divisions, the north and the south. Each field man confines his work to his particular division and reports regularly to his local committee. The field men are expected to visit the central-station managers and employees in the various towns and endeavor to influence them to closer co-operation with the contractor-dealers and to interest the contractor-dealers in their own particular association. They earnestly endeavor to promote better acquaintance between all the central-station employees and the dealers and contractors and their employees and to induce the central-station manager to indicate to his organization that it is the central station's policy to encourage and support this co-operative campaign.

The greater portion of the field men's time, however, will be spent with dealers and contractors. They will not only encourage harmony with the central-station men in each locality, but will go further with suggestions and advice along lines tending to help the dealer in handling his own particular business. It cannot be denied that a considerable proportion of the dealers and contractors have had little business training and experience. The field men will tactfully point out, where necessary, such modern business methods as will help the dealer to keep up with his work. Suggestions will be made regarding business getting, window dressing, store appearance, sales advertising, cost accounting, general accounting and other matters of like nature, always keeping in mind the fixed idea that every branch of the industry is directly interested in the increased sale, installation and use of all kinds of energy-consuming devices and appliances.

Intimate records will be kept by field men regarding dealers and contractors, their stores, business and personal character, and these records will be scrutinized by the advisory committee in order to gather intelligent ideas of the results of the field men's work and the permanent progress which has been made.

The advisory committee handles the larger problems affecting the industry, particularly in the relations of the different branches to each other. It successfully presents proposals to the several interests and serves as a common medium of intercourse in smoothing out local or general difficulties and misunderstandings for all parties. It is, in fact, the court of appeal in reconciling difficulties and passing on all suggestions made.

Results Achieved

It is an axiom that "the best test of all work is results," and before considering the results realized and expected it is well to consider the conditions heretofore existing. Perhaps California does not differ very much in electrical family relations when compared with other states in the Union, but at any rate there have been some more or less serious differences of opinion as to methods and responsibilities between various branches of the industry in the Golden State. The central stations as a rule have done everything reasonable to promote a greater use of electricity and increase the development of their business as rapidly as possible. In many parts of the state large blocks of hydroelectric energy have been developed and had to be marketed. The central station has had to find the market and create the demand. In carrying on this important work the central station has had to sell appliances, not only the larger appliances but also the smaller lamp-socket devices. However, in doing this necessary work the majority of central stations have been carrying out a policy of load building rather than a campaign of merchandising.

The manufacturer naturally wants an outlet for his products, and he is pleased to have the central station purchase and sell as many appliances and devices as it can. The manufacturer also wants the jobber, and through him the dealer and contractor, to handle his wares to as great an extent as possible. In other words, the manufacturer wants to sell through any and every channel. The jobber sells some electrical goods, including appliances, to the central station, but his larger and more profitable field is with the dealer and contractor.

The Appliance Business

Now some of the dealers and contractors have felt that all the appliance business should be sold by dealers and contractors only, and that the manufacturers should not sell to the central stations, and the central stations should not sell to their consumers.

The central stations know that it has cost them much money to develop the appliance load. They also know that if some branch of the industry had not done the development work which has created the demand large quantities of appliances would not have been sold and this important load would not have been obtained nor the income which automatically goes with it. The central stations also feel that the dealer and contractor have been reaping the benefit of the promotion work constantly carried on by the central station, and that instead of taking bread out of the dealer's mouth the cent station has really been putting bread into his mouth and money into his pocket.

Those in charge of the California electrical co-operative campaign have felt that there are no differences existing between the various branches of the electrical industry which cannot be satisfactorily adjusted. With each branch having a better and clearer understanding of the responsibilities, necessities and ambitions of the other branches, all are better qualified to negotiate, reciprocate and co-operate.

In order that a satisfactory basis might be attained for future efforts it was first considered necessary to get all branches of the industry together, and with this object in mind two big get-together dinners were held, one in March in Los Angeles and the other in June in San Francisco. Each was attended by about 400 earnest men, all meeting on a common ground, with a well-defined common interest at heart.

To many men who have been engaged in the electrical business in the state for some years these dinners were revelations because of the enthusiasm and good-comradeship displayed. Through the excellent work of the field men large attendances were assured, and those who did attend went back to their work feeling that

their time had been well spent. One of the field men, in a weekly report written some time after one of these big dinners, said: "Everywhere I have been since the meeting I have heard favorable comments on it, and many have asked when we are going to have another. It has given valuable assistance to our efforts. There are specific cases where it has been reported by dealers that an appreciably improved co-operation on the part of the central-station district agents has resulted from this meeting."

BENEFITS DERIVED AND ANTICIPATED

It is evident from the reports of the field men that the dealers and contractors are not only interested in the campaign but each one is anxious to get some benefit from it. Suggestions regarding window dressing are welcomed and acted upon at once; hints as to the appearance and arrangement of the store are willingly received, and questions are freely asked and cheerfully answered. The contractor-dealer is learning that there is a present benefit to be derived from an attractive place of business as well as a prospective advantage. The work of the field men in bringing together all the electrical heads in each community to discuss over a dinner table the general plans of the campaign and their local application will undoubtedly produce great results. It is plainly seen that such meetings have already done much to remove needless differences and old prejudices, and are really promoting a friendly feeling, based upon a realization that there is a community of interest in the business and that all may benefit by a better understanding and a closer co-operation. Some of the benefits already realized in certain towns and districts as a result of these meetings are:

1. The central stations and dealers agree to sell all lamps and appliances at manufacturers' list prices.

2. Central stations and dealers agree to sell on the same terms and conditions where sales are made upon deferred-payment plans.

3. Dealers and central stations agree upon the same scale of charges for repairs to electrical appliances.

4. Central stations are offering dealers the privilege of displaying in the central-station offices and showrooms special lines which they (the dealers) control. Dealers place neatly printed cards on these displays, giving what information they desire, and the central-station employees send inquirers to the dealers making such displays, or even make sales for the dealers without charge of any kind.

5. Central stations are offering to advertise the names and addresses of local dealers in their newspaper advertisements where dealers handle similar appliances to those advertised by the central station.

6. Some important central stations have agreed to withdraw their outdoor salesmen entirely from any district as soon as the advisory committee reports that the contractor-dealers in that district are in a position to handle properly the appliance sales and do the necessary work to continue the development of the business.

7. There seems to be a gradual awakening of electrical contractor-dealers to the possibilities of the retail side of their business, and they are surprised and pleased to find that the central-station men are fair and reasonable and are glad to meet them more than half way.

Considering the relatively short time that the active work of the campaign has been in operation, those in charge have a right to feel pleased with the results already attained. The ground has been broken, interest has been awakened, and advantages in getting together have been realized, in many instances, even before they were pointed out. The field now must be cultivated by careful, intelligent work and irrigated with the waters of courtesy, frankness and good feeling, pumped from the wells of experience and wisdom.

The California electrical co-operative campaign is educational and constructive It is pointing out to the contractor-dealer the promised land—the green vista of orders, sales and profits, not in the far distant future, but close at hand. The educational work prepares the contractor-dealer for what is coming to him if he only qualifies, and also prepares the central station for accepting the dealer's qualifications and gradually transferring the merchandising business where it belongs. The contractor-dealer must learn that he accepts added responsibilities which he must live up to if his ambitions are to be realized, and the central station must not forget that Rome was not built in a day and that the contractor-dealer will need constant assistance and co-operation to enable him to rise to the plane he is expected to reach. The California electrical co-operative campaign is now approaching the period when its work will be more clearly defined and really constructive in its character, and this work should soon lead up to the period when tangible results may be expected. The campaign was planned and financed for one year, but one year will only demonstrate how much it may be possible to accomplish. It seems evident, therefore, that the results of the first year's work will justify the continuation of the co-operative campaign along the same broad lines for some time to come.

Great men represent investments to their nations which cannot be counted even in millions of dollars. This nation must not become dependent altogether upon the scientific thought of others. Without the realization of the importance of original thought and investigation, the cultivation of science and the theory of its application, solely for the fascination and interest they exercise inherently upon some minds; without the realization of the importance of the modification of the department-store system of university education, of the fallacy of expecting great results from men "told" to make discoveries rather than creating an atmosphere in which those especially gifted may devote themselves to investigation; without the appreciation of such almost obvious premises, we cannot attain the scientific eminence which is the glory of England and of France and the source of human industry, and which we should covet for the greatness of America, our country.—*B. A. Behrend, Transactions A. I. E. E.*, Vol. 36 (1917), page 888.

What Commissions Are Doing on Rates

Careful Review of Conditions in California, Where the Applications So Far Cover More Than 50 per Cent of the Electric Utility Business—Action in Other States

Dealing with the general ideas underlying the attitude of state commissions on the question of electric rate advances, this article supplements similar articles in the issues of June 8 and June 29, 1918. It will be followed by other articles on the same vital subject.

IN ANALYZING and weighing the rate increases of electric central stations under war conditions the state regulating commissions are doing a public service which is highly important in the war program. They have had such large powers with respect to the companies that they are very familiar with operating conditions. They know that before the war began the companies generally had been regulated or keenly observed with respect to earnings on the capital investment. They are also accurately posted in regard to the heavy burden of extra cost which has grown with the progress of the war. The commissions appreciate that remedial measures are necessary.

STEPS TAKEN BY CALIFORNIA COMMISSION

Lester S. Ready, gas and electric engineer California Railroad Commission, says to the ELECTRICAL WORLD:

"The commission is authorizing electric utilities to increase rates on a definite showing of increased costs of operation where such increased costs of operation have reduced the net return below that which may be considered as a reasonable return under the conditions as they exist. In doing this the commission is giving special consideration to the preservation of the utilities' financial integrity.

"Three important applications for increase of electric rates, due to increased costs and emergency conditions, have been decided, as follows:

"Application 3531, San Joaquin Light & Power Corporation.—In the decision in this application the commission authorized the addition of a definite surcharge of 10 per cent to be added to all bills for service in accordance with the regular filed schedules. In the case of the San Joaquin Light & Power Corporation the commission had definitely fixed all of the schedules of rates for this company in 1916, and a reasonable division of costs had been made so that a percentage surcharge appeared equitable.

"Application 3459, Pacific Gas & Electric Company.—In this application the Pacific Gas & Electric Company requested an increase of 20 per cent on all commercial and industrial rates. Following the application and prior to the decision, a number of increases in costs of operations and conditions affecting the return of the company made it necessary that considerable additional increased revenue be allowed in order to meet the emergency conditions. The applications were amended to request of the commission such relief as it deemed necessary. In the decision of this application (Decision 5519) the commission first ordered the removal of all deviations and discriminatory contracts, then authorized the addition of the following surcharges: For energy sold for lighting service, including domestic, commercial and municipal metered service, 1 cent per kilowatt-hour; for energy sold for power service, including heating and cooking, 2 mills per kilowatt-hour; for energy sold for municipal street lighting, 10 per cent of monthly bills; for energy sold to electric railways, 1 mill per kilowatt-hour; for energy sold to other electric corporations, 1 mill per kilowatt-hour. The result of the application of these surcharges and the removal of deviations will be an increased gross revenue of approximately $2,000,000 per annum.

"Application 3460, Great Western Power Company System.—This application was filed at approximately the same time as that of the Pacific Gas & Electric Company and requested the same relief. Hearings were held in conjunction, and decision was issued on the same date. The relief granted was, in general, of the same character as that of the Pacific Gas & Electric Company, except that no surcharge was applied to street railway service or other electric corporations.

"To date the following companies have filed applications with the commission for increase in electric rates: Pacific Gas & Electric Company, Great Western Power Company System, San Joaquin Light & Power Corporation, California Telephone & Light Company, Needles Gas & Electric Company, Coast Counties Gas & Electric Company and Southern Sierras Power Company.

[Since this was written the Southern California Edison Company and Western States Gas & Electric Company have applied.—EDS.]

"All applications at present submitted have been decided.

"So far only about 25 per cent of the number of utilities have applied for increases in electric rates, but the applications so far cover over 50 per cent of the electric utility business in the state.

"It is difficult to state with any degree of certainty at the present time whether or not the conditions are permanent or temporary. One of the main causes for application for increase in rates is the shortage of hydroelectric power this year, caused by the low precipitation, with a resultant abnormal use of steam plants. This cause will to a large extent be removed upon the return of normal years of rainfall.

"A second cause which is material in its effect is the increased price of oil, which since 1916 has increased at least 100 per cent.

"A third cause which is of considerable importance is the need of the maintenance of the utilities' financial credit in order that they may extend to meet the increasing demand and supply adequate service.

"A fourth cause, which may affect the electric utilities in the northern part of the state more or less seriously during this year, is the possible necessity of discontinuance of less essential service; at least a material curtailment of same, due to the shortage of power."

ADVANCES IN GEORGIA

J. Prince Webster, rate expert of the Railroad Commission of Georgia, states:

"This commission has granted to the electric utilities in this state in specific instances increased rates based on showing of increased costs of operations and other considerations entering into such questions.

"The laws of this state prevent unjust and undue discriminations. The Railroad Commission of Georgia in

all rate increases referred to has made the same applicable to all classes of consumers.

"Within the last year the commission has received quite a number of applications for rate increases, and in the majority of instances certain advances have been allowed, though not in every case conforming to the petition of the utility."

POSITION OF CONNECTICUT COMMISSION

The Connecticut Public Utilities Commission gave information bearing upon its attitude to a representative of the ELECTRICAL WORLD.

Companies do not have to get the approval of the commission to rate advances unless rates are declared unreasonable. In case of a hearing on a rate increase the commission, of course, considers operating cost as an important factor.

Whether the application of rate advances is approved for all classes of consumers or only for special classes, upon a showing of increased cost of operation, depends entirely upon each case and the merits thereof.

No electric rate cases have been heard because no advances have been protested during the last year.

The commission has no means of knowing what proportion of the electric utilities are seeking higher rates because in Connecticut companies are not required even to file new rates with the commission. It is a fair assumption that not a few companies have increased rates.

As evidenced by its decision in the New London gas case, the commission holds that "the present abnormally high and constantly increasing cost of labor and material, especially oil used in the production of water gas, makes impracticable the establishment of a standard or scientific rate at this time, and any rate fixed to meet present unusual conditions should be only temporary and subject to prompt readjustment to meet changed or normal conditions." In that case the commission decided that "the rates complained of are not unreasonable under existing war emergency conditions."

The commission does not attempt to forecast the extent of rate changes after the war.

OKLAHOMA COMMISSION IS ACTING

The Corporation Commission of Oklahoma advises the ELECTRICAL WORLD that it is authorizing electric utilities to increase rates on a showing of increased cost of operation.

In such cases the application of the higher rates is approved to all classes of consumers.

Approximately eight authorizations for increases have been issued to electric utilities, no applications have been rejected, and four were pending when the commission's letter to this publication was written.

The situation is regarded by the commission as merely one of war emergency.

NORTH DAKOTA SITUATION

J. A. Little, rate expert and statistician Board of Railroad Commissioners of North Dakota, writes:

"The board has no power under our statutes to authorize or to interfere with advances in rates by public utility companies with the exception of telephones.

"The commission therefore has no policy with reference to the facts upon which the commission would grant an increase. We do know, however, that the utilities of this state have made some increases in their rates which in most cases take the form of a 10 per cent or 15 per cent surcharge which the company imposes for the duration of the war only.

"The board has power to fix maximum rates for public utilities upon the complaint of common consent of the city in which the utility operates, but, as stated above, the commission has no power to control increases in rates."

HYDROELECTRIC PROPERTIES IN MAINE

Benjamin F. Cleaves, chairman of the Public Utilities Commission of Maine, states:

"We have not yet finally passed upon the only application for increase of the rates of an electric utility, although we have the same under advisement. The application of the Penobscot Bay Electric Company for an increase in its rates at Guilford is the one pending, and the advance asked for is from 10 cents per kilowatt-hour to 15 cents per kilowatt-hour.

"As above stated, the Penobscot Bay application is the only one we have had, although it is not at all improbable that if present conditions prevail for any considerable length of time there will be a quite general request for permission to advance.

"I believe that here in Maine facts which may perhaps authorize an advance will be occasioned entirely by war conditions, and the necessity for increases will last no longer than the period during which the higher prices of labor and materials, other than coal, continue. Our companies are practically all hydroelectric companies, and the quantity of coal consumed is very small and used only in auxiliary service."

IN STATE OF WASHINGTON

Answering an inquiry from the ELECTRICAL WORLD, the Washington Public Service Commission writes that where the return is insufficient it is authorizing electric utilities to increase rates on a showing of increased cost of operation. In such cases the application of the higher rates is approved generally to all classes of consumers rather than only to special classes.

No applications of this character have been rejected and none were pending when the letter of the commission was written.

About 5 per cent of the electric utilities in the state were seeking higher rates, the commission wrote.

Whether the general conditions and results of electric utility operation will be altered permanently or the situation is merely one of war emergency is regarded as problematical by the commission.

REPORTS FROM OTHER STATES

E. G. Gallet, secretary Idaho Public Utilities Commission, writes that no applications for authority to increase rates had been filed by electric utilities during the year commencing July 1, 1917.

T. A. Browne, secretary Nebraska State Railway Commission, and George L. McCaughan, secretary Iowa Board of Railroad Commissioners, wrote that these bodies do not have rate-making authority over electric utilities.

Motor Drive in Newburgh Shipyard

Standard Types Chosen to Insure Prompt Delivery—Individual Motor Drive Selected for Speeding Output—Foolproof Equipment Permits Use of Unskilled Labor

BY W. H. EASTON
Westinghouse Electric & Manufacturing Company

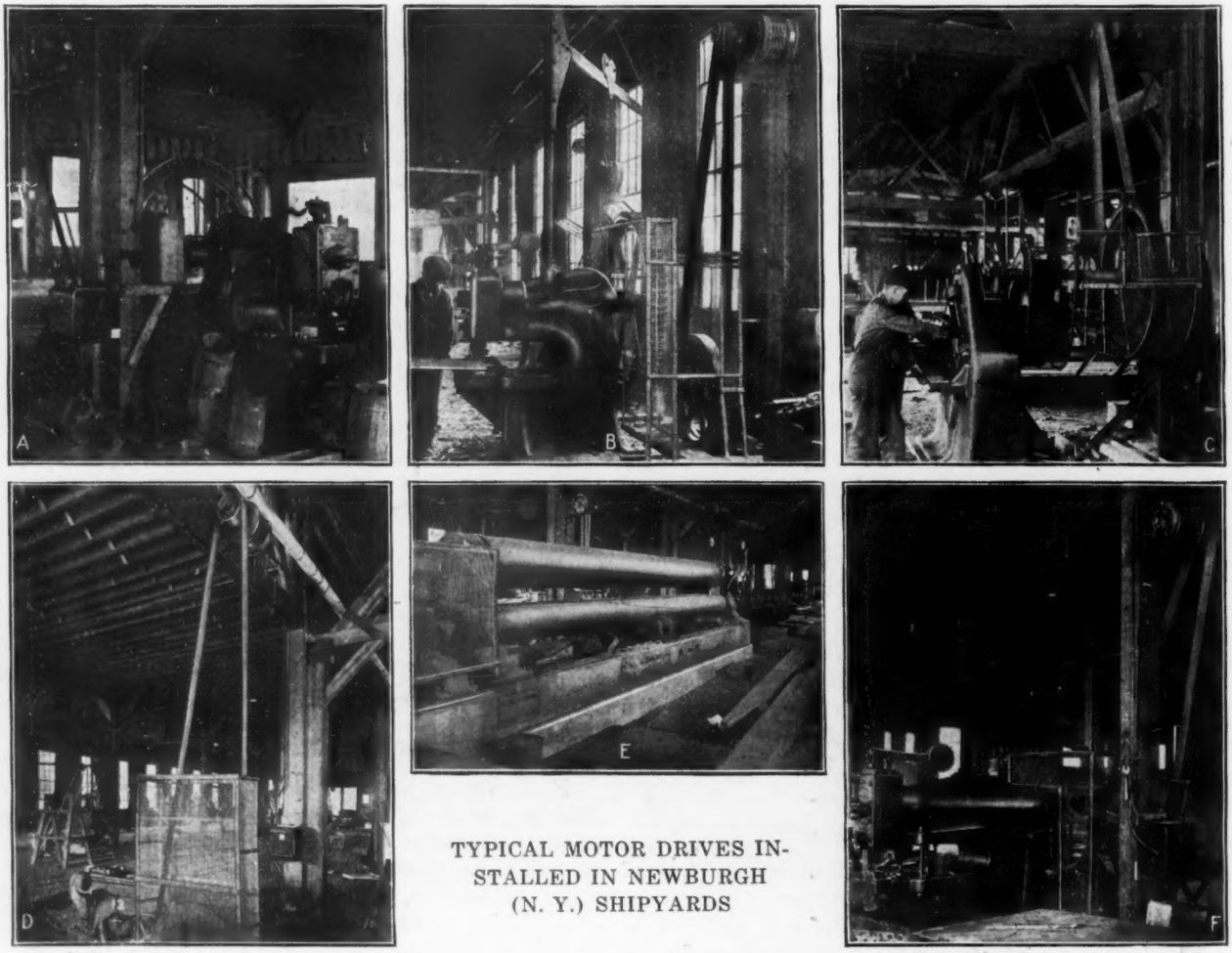
THE Newburgh shipyard is one of the shipbuilding plants that have been called into being by the war. A year ago its site was a marshland. To-day, on made ground that required thousands of cubic yards of fill, there are numerous buildings, four shipways and four large steel ships already under construction. The launching of the first of the standard 9000-ton steel cargo vessels on which this yard will specialize during the war will take place in August, and the other three will follow rapidly thereafter.

Of the various departments the structural-steel shop is the one at present in most active operation, though all the others will begin work in the near future. The system of motor drive employed in this shop is of special interest at this time because it is a typical example of an emergency war installation.

Some of the conditions that had to be taken into consideration in laying out this drive were the following: (1) The machinery had to be arranged to permit rapid and economical production. (2) The machines have to be handled by relatively unskilled men and hence must be safeguarded as thoroughly as possible. (3) Time is a vital factor, and as deliveries of special apparatus are nowadays very slow, the best possible use must be made of such equipment as can be obtained within a reasonable period of time.

As central-station power from the Central Hudson Gas & Electric Company was available, it was of course used, thus avoiding the erection of an isolated plant, saving the labor to run it, eliminating the handling of fuel and ashes, and helping to economize coal.

Alternating current only is supplied by the central station, and as practically all the machines in the shop (such as punchers and shears) are of the constant-speed type, squirrel-cage motors are used almost exclusively. The only exceptions are the furnace blower and the



TYPICAL MOTOR DRIVES INSTALLED IN NEWBURGH (N. Y.) SHIPYARDS

A—Vertical punching machine driven by squirrel-cage motor; operation is foolproof. B—Belt driving shearing machine will slip if torque requirement is too high for motor. C—Moving parts of angle shearing machine are inclosed in wire cage. D—Individual drive for horizontal punch giving maximum output. E—Bending rolls requiring variable-speed motor drive. F—Vertical punch geared to flywheel, which in turn is belted to the motor mounted overhead on the post.

bending rolls, both of which require speed variation. The furnace blower, supplying air for the crude-oil plate and angle furnaces, is driven by a slip-ring motor with a drum-type speed controller. The bending rolls were originally driven by a direct-current crane-type motor, which was supplied with current by a motor-generator set, but as this equipment was decidedly antiquated (war conditions making it impossible to secure modern apparatus at the time when it was wanted), a variable-speed alternating-current motor was installed in its place.

TYPICAL MOTOR DRIVES USED IN STRUCTURAL-STEEL SHOP OF THE NEWBURGH (N. Y.) SHIPYARD

Machine	Size	Motor*	Hp.	Type
Sturtevant blower.....	No. 10	Slip-ring†	50	C. W.
Hilles & Jones angle shears	6x6x⅞ in.	Squirrel-cage‡	5	C. S.
Hilles & Jones horizontal punch.....	¾-in. holes ¾-in. plates	Squirrel-cage	5	C. S.
Hilles & Jones shears.....	30 in.	Squirrel-cage	7	C. S.
Cleveland vertical punch...	⅝x⅞x36 in.	Squirrel-cage	5	C. S.
Hilles & Jones vertical punch	⅝x⅞x30 in.	Squirrel-cage	5	C. S

*All of the motors are Westinghouse. †Equipped with type MF control. ‡All of the squirrel-cage motors referred to in table are started with type A auto-starters.

Individual motor drive was adopted throughout the shop in order to insure maximum output from each machine and to provide complete flexibility as to the arrangement of the machines.

As can be seen from the illustrations, all the machines are belt-driven. This is not the best possible practice, since for such machines as punches or shears engineers usually favor mounting the motor on the machine and driving by means of gears. But this type of drive requires special machine work and a special, high starting-torque motor, and its adoption would have added months to the delivery date of the equipment. Hence standard motors with belts were used instead.

High-starting-torque motors would have been desirable, however, for driving these ponderous machines with their considerable flywheel effect, but it was thought that the belts would slip enough in starting to relieve the motors of the excessive stresses that occur at this time, and experience has proved this to be the case, since none of the motors has given trouble. This good record has been especially gratifying to the engineers in charge of the installation inasmuch as time did not permit a power test to be made of each machine, and the motors were selected largely by judgment and the supply of motors available for early delivery.

All belts, pulleys and gears are carefully protected by wire-metal screens, and all motors that are started and stopped by the steel workers are controlled by means of auto starters or oil switches which have no exposed live parts and cannot be improperly manipulated by even the most careless person. Automatic protection against overloads and failure of power is also provided.

The energy from the central station is received at 5700 volts. A small substation in the shipyard, consisting of a bank of transformers and a panel carrying the necessary switches and meters, reduces the voltage to 220 for use around the plant.

In the table printed above some typical data on the motor drive selected for this shop are presented.

Book Reviews

THE CALORIFIC POWER OF FUELS. With a Collection of Auxiliary Tables and Tables Showing the Heat of Combustion of Fuels, Solid, Liquid and Gaseous. By Herman Poole. New York: John Wiley & Sons. 267 pages, illustrated. Price, $3.

The original work by this author was published twenty years ago and the second edition a couple of years later, but since that time the knowledge of the value and utilization of fuels has so increased that the third edition is practically a new work on the subject. The rewriting was done by Robert Thurston Kent, M.E., and the book now covers the entire range of commercial fuels. Four chapters of the eleven deal with calorimeters and calorimetric calculations. The three chapters dealing with the various kinds of fuels are replete with tables giving the analyses and heating values of solid, liquid and gaseous fuels in all parts of the globe. The admirable work of the Bureau of Mines has been drawn upon freely in the compilation of these tables. The concluding chapters are devoted to a consideration of the calorific power of coal burned under a steam boiler and to the analysis and measurement of the products of combustion. The book contains in small compass a vast amount of valuable information, all of which is so well classified and arranged as to be available with little effort or loss of time.

THEORY AND OPERATION OF DIRECT-CURRENT MACHINERY. Prepared in the Extension Division of the University of Wisconsin. By C. M. Jansky. New York: McGraw-Hill Book Company, Inc. 285 pages, 214 illustrations. Price, $2.50.

This excellent elementary textbook on direct-current machinery is addressed particularly to the needs of students who have not had a preliminary mathematical or physical training such as is given by technical colleges to their engineering students. Consequently the scope of the treatise is necessarily limited to the more elementary considerations. Nevertheless, it is remarkable how much of the practical construction and operation of direct-current machines is clearly presented in the book; or, to state the same idea in other terms, it is remarkable how much of the essential elements of dynamo construction and operation can be expressed in simple language, without more than the simplest mathematical aid, as this book demonstrates. The treatment is clear and logical. The illustrations are excellent. There are sixteen chapters, relating to the following topics: Fundamental magnetic principles, electromagnetism, electromagnetic induction, units of measurement, transformation of energy, the continuous-current generator and motor, magnetic circuits, armatures, uses of electrical energy, types of dynamos, commutation, operating characteristics, operation and care of generators, characteristics of motors, operation of three-wire systems, selection and installation of dynamos. The book will be very serviceable to central-station operating men and to all who desire to acquaint themselves with the elementary principles of direct-current machines in construction and operation, and who are not interested in the more mathematical aspects of the subject.

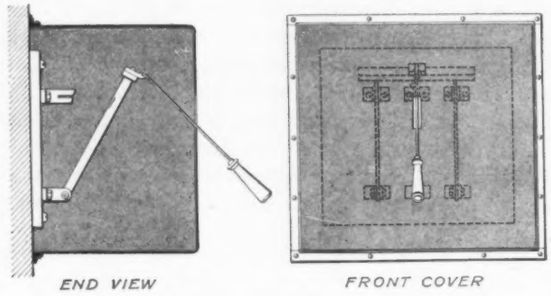
STATION & OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

SAFETY SWITCH THAT IS SIMPLE AND EASILY MADE

Device Can Be Constructed in the Shop from an Ordinary Knife Switch and a Metal Box—Danger to Operator Reduced

For controlling small motors and secondary circuits it is sometimes desirable to have a switch that will not endanger the operator and one that is not expensive to construct. The accompanying illustration shows a



SAFETY SWITCH THAT CAN BE MADE IN SHOP

safety-switch constructed in the shop from an ordinary knife switch and a metal-box. The box is lined with asbestos and has a small slot cut in the front side. Passing through this slot is a rod which has a fiber handle on the end outside the box, the other end being connected to the knife switch inside the box. The connection between the rod and switch is made with a hook attached to the bar of insulating material joining the switch blades. The hook is fastened to the bolt provided for the ordinary handle of the switch.

TESTING FOR FIRES IN PILES OF STORED COAL

Temperature of Pile Should Be Watched Closely and Coal Moved If It Rises to 175 Deg. Fahr.—Methods of Testing

Common methods for testing coal piles for heat are as follows: Watching when the pile begins to steam; observing the odor, which is that of either burning bituminous matter or burning sulphur; inserting an iron rod into the pile and when drawn out testing it with the hand; inserting a thermometer into a pipe driven into the pile; observing spots of melted snow on the pile. These methods were named by H. H. Stoek of the University of Illinois in a paper recently presented before the Western Society of Engineers.

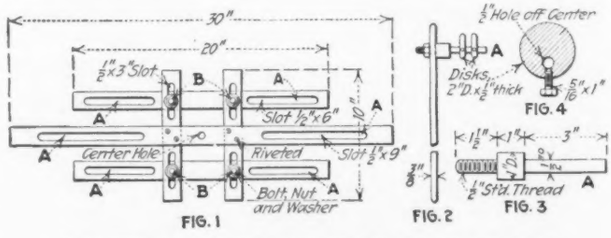
He said further that opinions differ in regard to the critical temperature in piles of coal. Professor Parr of the University of Illinois is of the opinion that bituminous coal can be stored without appreciable loss of heat value, provided that the temperature is not allowed to rise above 180 deg. Fahr. How close to this temperature a pile should be allowed to heat is largely a matter of judgment, for if the rise in temperature appears to be decreasing rather rapidly it may be safe to allow it to approach 180 deg. Fahr., whereas if the rise is steady and regular it is wise to load out the pile before the danger point is reached. The time also depends upon the means available for loading out the coal, for at a plant equipped with large grab buckets and means for rapidly handling the coal a higher temperature can be permitted than where a considerable time may be required to load out the coal. A person in charge of a certain kind of coal under certain climatic conditions will soon learn what the danger point is, and it is impossible to set any critical temperature that will apply to all coals under varying storage conditions. The only safe rule is to watch the pile closely and get ready to load out the coal when the temperature reaches 150 deg. Fahr. and to move the coal if the temperature reaches 175 deg. Fahr.

DEVICE FOR WINDING A COIL OF ANY SHAPE

Simple Iron Frame That Can Be Easily Constructed in Any Shop Eliminates Delay in Waiting for Coils to Be Wound

BY FRANK HUSKINSON

A device for forming coils of practically any shape is shown in the accompanying illustration. It consists merely of an iron framework fitted with several flat disks. By loosening the nuts (*B*) in Fig. 1, the two long rods can be adjusted vertically to give any



FRAMEWORK FOR WINDING DIFFERENT SHAPE COILS

width of coil within the limits of the device. Flat disks attached to the ends of each member of framework, as shown in Fig. 2, may be adjusted along the length of the rods to give the longitudinal dimensions of the coil to be wound. The wire is then wound around these disks.

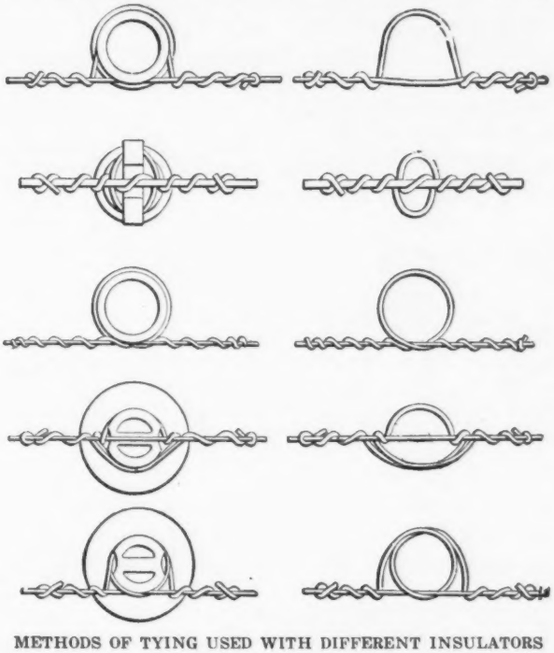
The device can thus be arranged for nearly all shapes of coils and can be made in permanent form for winding a number of the same size coil. The coils can be easily removed by loosening several of the disks.

STANDARDIZING THE TYING OF WIRES TO INSULATORS

Best Methods Used Universally Throughout System—Rules Issued to Linemen Facilitate Using the Same Kind of Tie When Possible

Having decided to standardize its method of making ties, a Western company issued instructions to its foremen to make sample ties with various sizes of wire and types of insulators so that each type could be examined and standards selected. With some insulators foremen were practically unanimous as to the method of tying; in other cases several methods were proposed. From these the best were chosen with a view to maintaining strength, flexibility and ease of application. The economy of material and labor due to standardization is obvious.

This company uses copper wire of medium hard-drawn grade, and experience shows that while good



METHODS OF TYING USED WITH DIFFERENT INSULATORS

ties can be made with a medium hard-drawn weatherproof tie on a weatherproof line wire, medium hard-drawn bare ties cannot be used to the best advantage on bare lines, as the bending radius is too small for these stiff wires. For this reason annealed bare wire is used for bare conductors. These are made by either purchasing annealed copper or by burning the insulation from scrap weatherproof wire. Care must be taken not to overheat the wire because this will cause the metal to lose its strength.

The accompanying diagrams show that the end wraps are not wound so closely as is usually done. The ties apply to moderate-sized conductors which are used in ordinary distribution systems and are not designed to supersede the various types of armored ties required for large aluminum or copper cables on transmission lines.

Experience indicates that with medium hard-drawn conductors a certain flexibility is desirable between the point where the line leaves the insulator and the last point of contact of the tie. In long-span work too rigid a support may result in breakage due to repeated bending just beyond the point of support. This occurs whether the wire be held by a tie or a clamp. Stranding the wire apparently obviates this trouble.

SCHEDULE OF TIES

Size of Line Wire (in Gage or In.)	Insulator	Top or Side	Tie Material	Tie Length (In.)	Type of Tie	Fig
COPPER						
6 or 4 w.p.	D.G.D.P.	Side	6 w.p.-m.h.d.	25	Western Union	1
2 w.p.	D.G.D.P.	Side	4 w.p.-m.h.d.	27	Western Union	1
1/0 to 4/0 w.p.	Cable	Top	4 w.p.-m.h.d.	36	Cross-top	2
1/0 to 4/0 w.p.	Cable	Side	4 w.p.-m.h.d.	30	Western Union	1
6 or 4 bare	D.G.D.P.	Side	6 bare ann.	27	Double	3
6 or 4 bare	11 kv.	Top	6 bare ann.	40	High-tension	4
2 bare	11 kv.	Top	4 bare ann.	40	High-tension	4
1/0 to 4/0 bare	11 kv.	Top	2 bare ann.	44	High-tension	4
6 to 4 bare	11 kv.	Side	6 bare ann.	40	Looped W.U.	5
2 bare	11 kv.	Side	4 bare ann.	40	Looped W.U.	5
1/0 to 4/0 bare	11 kv.	Side	2 bare ann.	48	Looped W.U.	5
STEEL						
¼ and 5/16	D.G.D.P.	Side	1 strand of 5/16 in.	27	Double	3
¼ and 5/16	11 kv.	Top	1 strand of 5/16 in.	44	High-tension	4
⅜	11 kv.	Top	1 strand of ⅜ in.	44	High-tension	4
¼ and 5/16	11 kv.	Side	1 strand of 5/16 in.	48	Looped W.U.	5
⅜	11 kv.	Side	1 strand of ⅜ in.	48	Looped W.U.	5

Instructions to line foremen are issued as follows:

On straight lines all wires shall be tied in the top groove of insulators having top grooves. On insulators having side grooves only tie on the pole side. Those on the pole pins should be tied on the outside. At curves and corners all wires should be tied away from the strain so that the line wire shall bear against the insulator.

Weatherproof ties should be cut from scrap pieces in the field, either new or second hand, if of good quality. Annealed weatherproof may be used if available. Old ties should not be straightened and reinstalled, as they are too hard and brittle after repeated bending.

Bare copper ties cut to length are supplied by the storeroom. They should be made from annealed, but not overheated, scrap, or from new annealed wire.

METHODS OF INCREASING POWER-PLANT EFFICIENCY

Reasons Why Power-Plant Owners May Expect Reductions in Losses of Modern Stations Are Outlined

Higher boiler pressures, higher temperatures of superheat, higher vacua, the use of powdered coal, the installation of boiler efficiency instruments and the introduction of bonus systems are six means which an operating engineer in the Middle West considers as most likely to produce important coal savings. Boiler pressures higher than the standard are considered the most important source of saving. While the general impression now is that no saving can be made by going to higher pressures on account of the high cost of the equipment, it is the belief of some engineers that when development charges have been somewhat reduced it will be possible to make high-pressure equipment at less cost than apparatus for 200 lb. (14 kg.) pressure. This opinion is based upon the belief that the boilers for higher pressures will contain smaller tubes, which will give more area with the use of less metal. While the theoretical saving which can be made by the use of higher superheat is small, the actual saving is really greater than the theoretical saving, owing to the fact that the elimination of moisture from the steam throughout a large part of the duty cycle of the steam very largely reduces friction losses. As is well known,

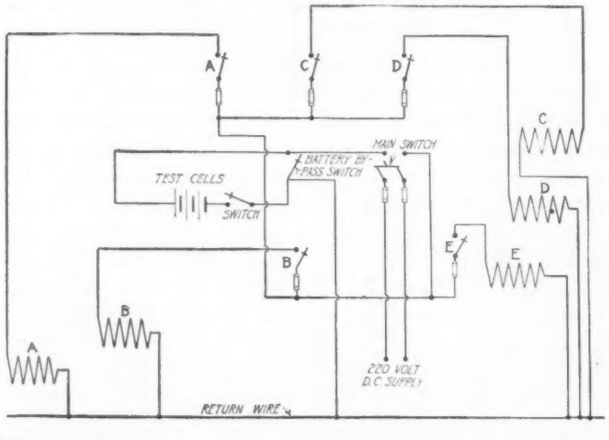
many experimenters are working on the problem of powdered coal, and although a number of attempts have been made to promote fraudulent schemes in this field, a real and legitimate work is being done. Sooner or later it will bring about successful means to release for active work more of the heat units in coal.

The saving which can be made through the use of higher vacua is probably one that demands attention in every plant at the present time. All operators do not thoroughly realize that an increase in the vacuum from 28 in. to 29 in. (71 cm. to 74 cm.) effects a 4 per cent saving on the coal pile, the engineer referred to says. It is usually practicable to make such an increase, although it sometimes entails the installation of better air-pump equipment. Installing boiler-room efficiency instruments and adopting bonus systems should be considered together. They assume increased importance daily as the shortage of power-plant labor becomes more apparent. It is altogether possible that the tendency of the coming year will be to employ more intelligent help for the boiler room, even to the partial neglect of the turbine room, so that the investment in boiler-room efficiency instruments and the bonus-paid employees may be capitalized to the fullest extent.

ELECTRIC HEATERS CAN SERVE A DUAL PURPOSE

Apparatus for Heating Meter Laboratory Arranged So that Storage Battery Can Be Placed in Circuit for Charging

During the coal shortage last winter electric heating was used with much success in the meter laboratory of the Cumberland County Power & Light Company, Portland, Me., energy being supplied from the company's hydroelectric transmission system. Five units rated at 220 volts and 20 amp. each were provided, but two were found sufficient to maintain a temperature of 70 deg. Fahr. even in zero weather. The room is about



CONNECTIONS THAT PERMIT HEATING AND BATTERY CHARGING

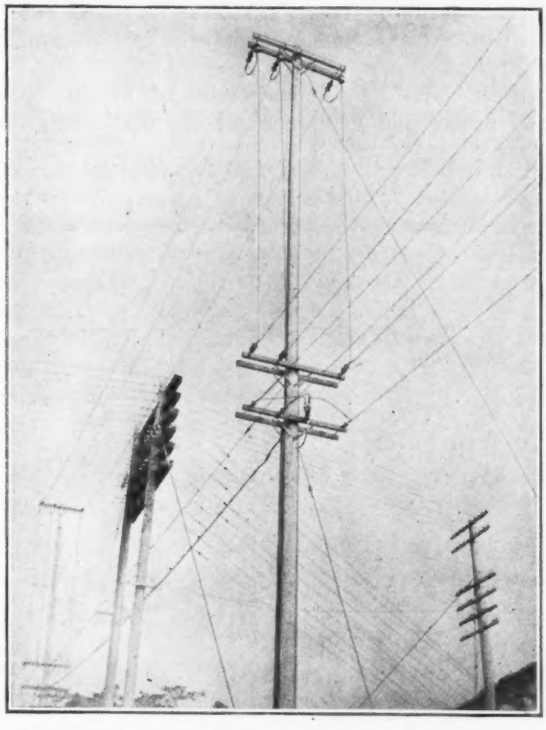
50 ft. (15.2 m.) long, 40 ft. (12.2 m.) wide and 12 ft. (3.7 m.) high and has four windows in one wall and one in another. The resistors were connected so that any number could be placed in parallel to charge a storage battery used for test purposes.

The connections are shown in the accompanying diagram.

POWER-LINE CROSSING OVER TELEPHONE-LINE ANCHOR POLE

Accomplished Economically by Raising the Span Crossing Over the Telephone Pole and Using Aerial Cable for Lower Voltage Circuit

After a river had changed its course during a flood, a telephone company found it necessary to relocate a river crossing span on an important intercity toll line. It so happened that the only feasible location for the anchor tower at one side of the crossing was immediately under a power supply line carrying an 11,000-volt and a 2300-volt circuit on 40-ft. (12.2-m.) poles. To



METHOD OF CROSSING OVER TELEPHONE LINE WITH 2300-VOLT AND 11,000-VOLT CIRCUITS

secure proper clearances over the telephone tower for both supply lines would have required 80-ft. (24.4-m.) poles and grading down to the 40-ft. (12.2-m.) poles on each side by 10-ft. (3-m.) steps. This would have required the changing of eight poles, four on each side of the crossing. By using the method shown in the accompanying illustration only the poles adjacent to the crossing were changed, these being made 75 ft. (22.9 m.) high.

The 11,000-volt line was connected to the poles shown at the standard level and jumpers connected with the upper level which was held by appropriate strain insulators.

Stranded medium hard-drawn copper was used in the crossing span, the rest of the line being solid. The stress in the spans adjacent to the crossing was balanced by means of a well-insulated guy across the span and by anchor guys which were connected to the pole tops. In order to simplify the vertical circuits the 2300-volt circuit was run under the telephone lines by using a three-conductor lead-covered aërial cable with suitable pot-heads at the ends.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

DISCUSSION OF CENTRAL WEST RATE SITUATION

Necessity for Higher Rates—20 per Cent Increase in Small Towns Does Not Bring Proportionate Increase in Revenue

Discussion of the rate situation at the convention of the Iowa Section, National Electric Light Association, was led by W. A. Warfield of Peoria, who pointed out that public utility commissions and courts are giving utilities a square deal in the cases asking increased rates which are now before them. Ninety-two per cent of the cases presented have been acted upon favorably. In all cases before courts and commissions utilities should emphasize the necessity for a larger rate of return, otherwise the industry will be unable to get the money which it needs to carry on its operations.

In reply to questions during the discussion Mr. Warfield stated that the Illinois Traction Company had asked for increases in electric service rates in nearly every community in which it operates. Where emergency increases were asked for these have been granted almost in total. Where permanent increases were sought an evaluation was necessary. In most cases it has been found expedient to apply for emergency increases. Action on rate cases is much more prompt in states where commissions are in existence than in states where rate increases must be taken up with the local city council. Where it has been necessary to go to customers directly to gain increases in revenue the company has found the public very fair and willing to allow it a fair profit.

In the State of Illinois the company's plan of asking for an increase was to survey the needs in each city and to ask for a percentage of increase in accordance with the needs of each town. Mr. Warfield pointed out that the Public Service Company of Northern Illinois had tried a different method, namely, that of grouping towns of similar character and applying for a 15 per cent increase on the power schedule then in effect The commission in respect to this case instructed the company to file a schedule that would give 15 per cent increase on the power rate, and then granted that schedule.

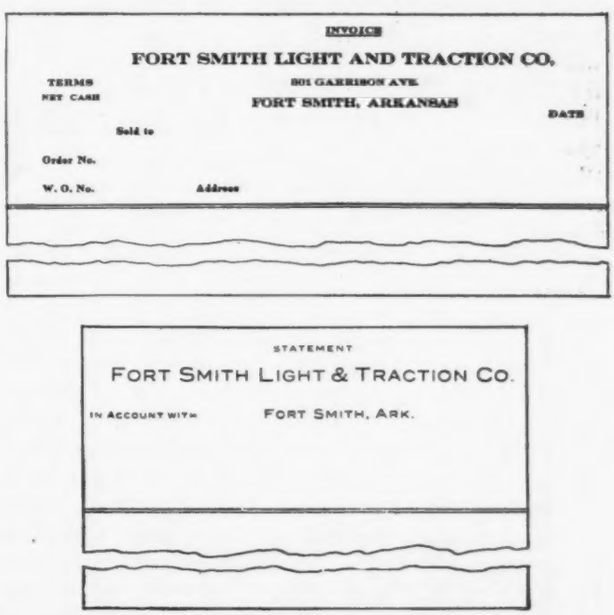
W. H. Abbott of Omaha stated that two-thirds of the properties of the Continental Gas & Electric Corporation in Iowa and Nebraska had been granted increases which averaged around 20 per cent. In some cases it was necessary to increase residential lighting rates which were at 15 cents to 20 cents. No trouble was experienced in the cities in which increases had been asked for, but some difficulty was expected in other cities. In reply to a question, Mr. Abbott said that the 20 per cent increase which had been granted had shown only a 5 per cent increase in the revenue, because of the curtailment of service following the adoption of the daylight-saving law and the natural curtailment following increases in prices.

Further discussion resulted in bringing out the fact that in small towns of about 750 population the best method of getting additional revenue was to raise the minimum charge from $1 to $1.25. It was also thought that many power rates are too low. It was held in this connection that the demand charge should not be changed but that energy rates should be increased. An increase of 0.5 cent per kilowatt-hour in the case of a 15-hp. customer was not thought to be too much.

A BILL FORM THAT CONTAINS MINIMUM OF PRINTED MATTER

Clean Appearance on Invoices and Statements Obtained and Convenience Achieved by Eliminating Sentences Not Always Useful

In an effort to arrive at a clean-looking and convenient form for bills and statements other than those for energy consumption, the Fort Smith (Ark.) Light &



SIMPLE BILL HEADINGS USED BY ARKANSAS COMPANY

Traction Company has adopted the kind shown in the accompanying illustration. The feature of these records is that neither of them has the usual amount of reading. In drawing them up this plan was strictly adhered to, it being thought that printed matter which is not used in every instance on a statement or invoice is confusing and hurts the appearance of the sheet, while a statement or invoice that has no extraneous matter is very much more legible and understandable.

TUNGSTEN LAMPS HELP SELL WAR SAVINGS STAMPS

Dayton Company Advertises Wastefulness of Carbon-Filament Lamps and Suggests Change to Tungsten to Help Government Loans

"Win-the-war," advertising recently published by the Dayton (Ohio) Power & Light Company is of interesting character. A typical piece of copy, here reproduced,

W·S·S
SAVE and SERVE
BUY
WAR SAVINGS STAMPS
For Sale by Banks, Post Offices, Letter Carriers and other Agencies.
Stop
using carbon and gem lamps in your home, store or factory, and with your savings,
Buy Thrift Stamps
For sale at our office, the Post Office, Banks, Letter Carriers and many other places—
And Help the Government
Carbon lamps are wasteful—a carbon lamp requires two and one-half times as much coal as a Mazda Lamp of similar candle power. Conserve the coal supply of the nation—do everything you can to help
Win the War!
COMPARISON IN COST OF LIGHT DURING AVERAGE LIFE OF LAMP
GEM Lamp, 20 CP, 50 Watts, $4.50—MAZDA Lamp, 20 CP, 25 Watts, $2.43
Saving $2.07=8 Thrift Stamps
The Dayton Power and Light Company
50 South Jefferson Street

points out the wastefulness of carbon lamps and shows how many thrift stamps can be bought by the savings made by changing from carbon to tungsten-filament lamps.

RESULTS FROM THOROUGH TRAINING OF SALESMEN

New York Company Disposes of 260 Vacuum Cleaners in Forty-One Days with an Average Net Profit of $11.73 per Machine

A recent and very successful suction-cleaner campaign conducted by the Schenectady (N. Y.) Illuminating Company emphasizes the importance of the thorough schooling of the salesman in the demonstration of his appliance. The Schenectady campaign began last November with a twenty-three-day sale of Hoover suction cleaners, in which 110 machines were placed on circuit. This was followed by continuous follow-up selling until January, when another short campaign was featured for a period of eighteen days, in which 150 cleaners were disposed of. This made a total of 260 cleaners sold in the two campaigns at an average net profit of $11.73 per cleaner, a most satisfactory operation, both from the standpoint of profit and of service to the consumer in these days of servant shortage. The sales were made for cash or on the easy payment plan for $3 down and $6 a month, as the customer preferred.

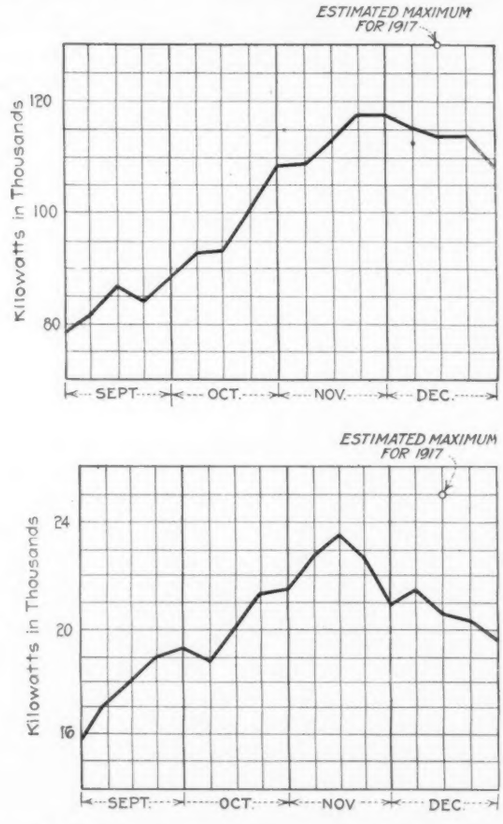
This campaign was planned and directed by Sales Manager C. E. Cass of the Schenectady Illuminating Company, and it is interesting to note that he attributes its success largely to the fact that each salesman who participated was "thoroughly sold on the cleaner" by personal use of a machine at home before he was sent out to talk about it.

Each employee of the sales department was given an opportunity to take a sweeper home for a month and become thoroughly familiar with it by actual use in his home. The company sent a sweeper also to the home of each head of department and foreman who did not already have one. The enthusiasm and confidence thus secured proved to be one of the large factors in the success of the campaign. Incidentally the wives of these employees were so well pleased with the cleaner that about 90 per cent of them were purchased. The result was a degree of enthusiasm among the salesmen enlisted in this campaign that developed ingenuity of a high order in overcoming obstacles to individual sales.

CENTRAL-STATION CUSTOMERS' PEAK-LOAD DISTRIBUTION

New Jersey Company Has Plan Whereby 5.5 per Cent Relief Was Obtained Without Any Reduction in Kilowatt-Hour Output

Equalization of the peak loads of customers in order that existing station capacity can be utilized more fully is of unusual importance at the present time. At the recent N. E. L. A. convention at Atlantic City, N. J., R. R. Young presented a paper telling how this plan was



PEAK-LOAD DISTRIBUTION OF NEW JERSEY ELECTRIC COMPANY; NORTHERN ZONE ABOVE, SOUTHERN ZONE BELOW

worked out and of the results obtained by the Public Service Electric Company of New Jersey.

The territory of this company in so far as generation and distribution is concerned is divided into two zones, designated as northern and southern zones, the

southern zone comprising Trenton, Burlington and Camden with adjacent territory, the northern zone comprising all north of and including New Brunswick and its adjacent territory.

Late in the summer of 1917 the company found that it would be unable to start a 35,000-kw. turbine and a 12,500-kw. turbine which were under erection in two of the largest generating stations. It was decided, therefore, that, beginning with November, a systematic canvass of power customers should be made, asking the cooperation of the manufacturers using 50 hp. and more in redistributing their load throughout the day so that heavy demands which ordinarily might occur between the hours of 4.30 p.m. and 9 p.m. would be changed to some other hour during the twenty-four-hour day.

RESULTS OF CAMPAIGN TO EQUALIZE CUSTOMERS' PEAK LOAD

Division	Total Kw. Connected Load in Power	Promised Kw. Relief	Promised Percentage Relief	Actual Relief Obtained Kw.	Actual Relief Obtained Percentage
Essex	73,000	4,360	5.9	.....	....
Hudson	40,000	5,245	13.1	.....	....
Passaic	20,000	1,852	9.2	.....	....
Central	41,500	3,909	9.4	.....	....
Bergen	9,700	1,050	10.8	.....	....
Total	184,200	16,416	8.9	10,000	5.4
Southern Zone	23,900	2,931	12.2	1,500	6.3
Grand total	208,100	19,347	9.3	11,500	5.5

Blueprints showing a typical twenty-four-hour composite load curve of the generating stations for December, 1916, were prepared for the power representatives and agents, and a mock interview was held to illustrate the methods to be used in presenting the case to the manufacturers.

REPORT ON REDUCTION OF PEAK

Customer .....

Business .....

Address .....

Town .....

Substation from which customer is fed.....

.....

Connected load .....hp.....kw.

Maximum demand .....kw.

Demand 4 to 9 p.m.....kw.

Promised relief at peak.....kw.

Remarks:

Interviewed by:

.....

Signed:

.....

After the company's organization had been thoroughly prepared, the men began about Nov. 1 to visit the power customers, the campaign continuing throughout the month of November. Report forms were prepared and results of the calls upon individual customers were reported daily, these reports being tabulated by the general office. Weekly meetings of the power representatives in the state were held to discuss difficulties encountered and methods of overcoming objections.

Inasmuch as the rate schedule includes no off-peak provisions, the only advantage the manufacturer was to derive was the possible reduction of his average demand, thus reducing his demand charge somewhat besides giving him greater insurance against interruptions in service.

The result of this campaign in promises from the customers is shown in the table.

Owing to the fact that customers were probably not able fully to live up to their promises, and there being some diversity in the peak loads, it is estimated that the result of the off-peak canvass was the securing of approximately 10,000 kw. reduction in demand in the northern zone and 1500 kw. reduction in demand in the southern zone. In fact, the maximum peak occurred in the last week in November in the northern zone, whereas, the peak of former years had been occurring in December.

Kilowatt-hours sold during November and December indicated that no curtailment of use resulted from reduction of peak. In other words, the maximum capacity required was reduced by 11,500 kw. without reduction in output on the part of the manufacturer.

The daylight-saving law as now effective will not help the fall peak. If the period is extended to cover the entire year, the saving in necessary capacity by the central station will be considerable.

WHERE COMMISSION HAS NO RATE JURISDICTION

Successful Method That Has Been Followed in Iowa Might Find Application in Other States

In Iowa, where the Public Utilities Commission has no jurisdiction over rates, all applications for increases in electric-service rates must be taken up with the local city council. One company which has had considerable experience in this work has adopted the following plan in connection with all of its rate increases:

The necessity for more revenue is made the topic of discussion at a meeting of the city council, where the company explains its point of view. Following this, the rate which has been decided upon is put into effect. In case the city council should take definite action against the company to prevent application of the increased rate, the company files an injunction in the federal court which prohibits the city council from interfering with the new rate schedule which the company has filed. If the legal department of the city should continue the case in federal court, the company feels that this court is removed from the influence of politics and therefore less liable to give a biased decision.

TECHNICAL THEORY & PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Graphical Method of Predetermining the Heating of Electric Machines.—G. GUT.—The various analytical and graphical methods of calculating the temperature-rise curves for a machine from the exponential equation are reviewed. A new graphical method is then described in which "nomographic" diagrams are employed. These diagrams, devised by the French mathematician d'Ocagne, have the object of evaluating expressions in which relations appear between more than two variables. The process is applied to the case of machines that are intermittently loaded and enables measurements below the maximum permissible load of the machine to be used to predetermine the parameters, the direct measurement of which would necessitate overloading the machines.—*Science Abstracts, Section B,* May 31, 1918 (abstracted from *Schweiz. Elektrot. Verein,* February, 1918).

The Essentials of Transformer Practice, Part XI.—E. G. REED.—General design relations are considered in particular, the subject being treated mathematically in the following order: Relation between the output, dimensions, weight and cost; relation between the output and the sum of the iron and copper losses; relation between the total equivalent loss and the dimensions, weight and cost of a transformer, and variation of the cost with the space factor of the winding section.—*Electric Journal,* June, 1918.

New Commonwealth Edison Turbine.—J. F. JOHNSON.—Details regarding the mechanical and electrical features of the new tandem-compound turbine installed by the Commonwealth Edison Company, Chicago, are given: Axial ventilation is used for the stator. Cooling air is passed through openings in the iron parallel to the shaft and discharged from an annular central duct into the frame casing. This arrangement allows the use of the shortest possible rotor, increasing the stiffness of construction and hence insuring freedom from vibration. Further, from a cooling standpoint, it permits of the most intimate contact of the air with the iron, and since the heat conduction is greatest along the plane of the laminations, any tendency toward hot spots in the iron is reduced to a minimum. The rotor construction is of the so-called plate type, in which disks approximately 2 in. (5.08 cm.) thick are rabbeted into each other and threaded upon through-bolts at their outer periphery. The insulation of both stator and rotor, which is of mica, is intended for a temperature of 150 deg. C. continuously. The temperature of the stator is measured by embedded detectors, and that of the rotor by the increase in resistance of the field coils. One reason for using mica is its ability to withstand corona or static discharges without injury. To withstand direct short-circuits without injury to the stator winding they are very rigidly braced.—*Electric Journal,* June, 1918.

Lamps and Lighting

Electric Lamps and Lighting.—J. ONDRACEK.—Proposes the use of the Fourier series for the determination of the polar curve of a light-source radiating symmetrically about its axis The intensity is measured in, say, five different directions, viz., at 0, 30, 45, 60 and 90 deg. with the horizontal, and from these values the first five coefficients of the Fourier series are calculated, and hence the mean spherical or mean hemispherical candlepower deduced.—*Science Abstracts, Section B,* May 31, 1918 (abstracted from *Elektrot. u. Maschinenbau,* Feb. 17, 1918).

Filaments of Crystal Wire.—O. ELY.—A general article on metal filaments with special reference to the tungsten wires. The wires proved mechanically strong after 1200 hours' burning, and there was no black deposit on the inside of the bulbs.—*Science Abstracts, Section B,* May 31, 1918 (abstracted from *Zeits. Vereines Deutsch.,* Jan. 12, 1918).

Better Lighting of Machine Shops.—F. H. BERNHARD.—The imperative need for improved lighting, the numerous benefits resulting therefrom, its low cost, how poor lighting can be quickly recognized and the requirements of a good system are some of the points discussed in this article. The resulting benefits are given as follows: (1) Reduction of accidents, (2) greater accuracy in workmanship, (3) increased production for the same labor cost, (4) less eye strain, (5) better working and living conditions, (6) greater contentment of workmen, (7) more order and neatness about the plant, and (8) supervision of the men made easier. Examples of lighting, including cost data and a chart of illumination intensities, are embodied in the article.—*Electrical Review,* Chicago, June 1, 1918

Generation, Transmission and Distribution

Voltage Variations in Three-Wire Alternating-Current Transmissions.—J. TEICHMUELLER.—The locus of the vector representing the voltage drop on a three-phase circuit is shown to be a parallelogram. The shape of this parallelogram is investigated for various sections and arrangements of the line conductors. New formulas are obtained for the variations of voltage in terms of the relative voltage drop, the power factor of the line and receiving apparatus.—*Science Abstracts, Section B,* May 31, 1918 (abstracted from *Elektrotechnische Zeitschrift,* Nov. 8, 15 and 22, 1917).

Electric Power Supply.—A synopsis is given of an address before the Incorporated Municipal Electrical Association at Manchester by S. J. Watson. It is pointed out that in the great industrial district about Manchester, England, electrical energy is not used to the extent

it should be. One reason for the under-development of electric drive is its high cost in this locality, due principally to the existence of eighteen generating stations with a total capacity of 185,000 kw. Mr. Watson pointed out the enormous operating costs and lack of efficiency in such a system and advised the construction of large plants of about 100,000 kw. rating to replace the many smaller ones.—London *Engineering*, July 21, 1918.

World Records in Water-Power Development.—Seventeen notable hydraulic developments in the states west of the Rockies are described, showing wherein each one has set a world's record for its class. An illustration of each development is given.—*Journal of Electricity, Power and Gas*, July 1, 1918.

Coal Consumption in Large Generating Stations.—ALFRED S. L. BARNES.—By means of data obtained from plants in the United States and Canada the author plots a curve between station capacity and coal economy, showing that there is not a great gain in economy by increasing station sizes above 75,000 kw. This point was brought out in connection with a discussion as to the advisability of installing stations of great size in England for the purpose of increasing economy.—*Electrical Review* (London), June 21, 1918.

Rotary Converter and Transformer Connections.—Three methods of starting rotary converters from the alternating-current side by means of a separate starting motor and from the direct-current side are explained.—*Southern Engineer*, June, 1918.

Traction

Dynamic Braking of Electric Motors.—E. M. BOUTON.—It has been shown that while dynamic braking does not eliminate the use of a friction brake, it has some very distinct advantages over the friction brake for reducing the speed of a motor. These are: (1) The stored energy of the armature is largely dissipated in an external resistance, which may be so located as not to affect the motor. In the case of a friction brake this energy must be dissipated by the brakeshoes and wheel, which are close to the motor. (2) A quicker stop can be made with dynamic braking owing to the time element of the friction brake in setting. The quickest stop, however, can be made with a combination of the two. (3) The kinetic energy of the revolving armature is delivered directly to an external circuit and does not have to be transmitted through the shaft to the brake wheel, thus relieving the shaft of considerable strain. (4) In cases where an accurate stop is not necessary the equipment for dynamic braking takes up less room and will have a lower maintenance cost than a friction brake. (5) In cases where a friction brake is necessary to hold the load, it is desirable to use dynamic braking for slowing down. This relieves the friction brake of much wear and tear and consequent expense in upkeep. Disadvantages of dynamic braking are: (1) The motor cannot be brought to a complete stop unless the driven load has considerable friction. (2) Dynamic braking cannot be obtained in case of voltage failure without the use of a series winding. (3) A controller for dynamic braking requires an additional contact and resistance, which adds to the cost. (4) If the motor is stopped very frequently by dynamic braking, its capacity must be greater to take care of the heating. (5) Dynamic braking is not generally applicable to alternating-current motors.—*Electric Journal*, May, 1918.

Installations, Systems and Appliances

Self-Restoring Properties of Lightning Arresters.—H. G. BRINTON.—The author first reviews the principles underlying all lightning arresters and then discusses in particular the restoration of the lightning arrester to normal conditions following the dynamic discharge. Only General Electric arresters are considered, among these being the magnetic blow-out arrester, the horn gap, the aluminum-cell arrester for alternating as well as direct currents and the vacuum-tube arrester for low-voltage telephone systems. Attention is called to the fact that in the operation of the horn-gap arrester the rise of the arc takes several seconds, so that a series resistance must be used which will stand the discharge current for a considerable period of time. Thus the horn-gap arrester is most useful in connection with constant-current circuits such as are used in street-lighting systems where the current is limited by a regulator to a small value.—*General Electric Review*, July, 1918.

Electrical Propulsion of Ships.—WILLIAM R. L. EMMET.—Relates to the propulsion of warships and dwells on the flexibility of electric drive. One advantage of electric drive is that a turbine can be stopped without having to stop the propellers. Furthermore, the going-astern turbine is eliminated, making it possible to develop as much power going in one direction as in the other and permitting higher superheat and consequently increased fuel economy. For efficient propulsion it is advisable to maintain a very low turn speed at the propeller, which usually requires the use of a reducing gear between the screw and motor if the size, weight and cost of the latter are to be kept at a minimum. This reducing gear cuts down the mechanical efficiency of transmission, of course, but it still remains relatively high. Electric drive is particularly desirable under cruising conditions because it permits shutting down part of the turbines, leaving the others to work under favorable conditions. The use of three-phase equipment required by reason of the great motive power employed has a very unfortunate characteristic in that it does not facilitate maneuvering. If it were possible to use direct-current apparatus, the reversals of movement as well as the simpler and more gradual regulation of speed could be accomplished by simply controlling the exciting current without varying the turbine speed or breaking the main currents.—London *Engineer*, May 17, 1918.

Electrophysics and Magnetism

Relation Between Electrical and Thermal Conductivities of Metals.—S. WEBER.—An application of Knudsen's method to the determination of the relationship between the electrical and thermal conductivities of a metal. Experiments on a tungsten filament in vacuo gave for the thermal conductivity the value 0.383 gm. cal. per cm. deg. From this the value of $k/\varkappa$ is found to be 786 $\times 10^{-3}$, where k is the thermal and x the electrical conductivity. According to the Lorenz law the ratio $k/\varkappa T$ should be constant, but a comparison of the above value with that found by Langmuir at 2200° K. shows that this function possesses a temperature coefficient which approximately agrees with that found by Jaeger and Diesselhorst. Further experiments are described re-

lating to the physical constants of tungsten and platinum filaments at low temperatures.—*Science Abstracts, Section A*, May 31, 1918 (abstracted from *Annalen der Physik*, Feb. 22, 1918.)

Influence of Magnetic Field and Mechanical Stirring on Potential Difference of Electrolytic Cell.—TOSHIKAZU MASHIMO.—With platinum electrodes immersed in a dilute iron trichloride solution, the effect of a magnetic field on the potential difference between the electrodes is especially noticeable when it is applied to the cathode, according to investigation made by the author. The diminution of the potential difference between the electrodes was less when a cobalt-salt or nickel-salt solution was employed. With the iron electrodes the effect was more complex. When a weak magnetic field was applied to the anode the potential difference between the electrodes increased, and when it was applied to the cathode it diminished. But with a strong magnetic field, whether applied to the anode or cathode, a decrement of the potential differences was always observed. With a relatively strong electric current in the battery circuit, the magnetic field caused the diminution of the potential difference between the electrodes when it was applied to either of the electrodes. But with a weak current a small increment of the potential difference was observed in the case of the anode. Mechanical stirring of the electrolyte near one electrode affected the potential difference between the electrodes like the application of a magnetic field to that electrode. With a weak current in the battery circuit the potential difference diminished when the electrolyte near the cathode was stirred and increased when the electrolyte near the anode was stirred. When the current in the battery circuit was made stronger the effect at the cathode was especially noticeable compared with that at the anode. Agitating the electrolyte near one electrode established a new electromotive force between the electrodes of the same metal immersed in its own or other salt solutions. When the electrolyte in proximity to the metal was stirred the latter became anode or cathode, according to the nature of the metal and the solution used.—*Memoirs of the College of Science*, Kyoto Imperial University, October, 1917.

Effect of Electric Field on Spectrum of Helium.—TOSHIO TAKAMINE and USABURO YOSHIDA.—Employing Lo Surdo's method, the effect of an electric field on the spectrum lines of helium has been investigated. Relying on Stark's data, the intensity of the electric field has been calculated from the amount of separation of the outer components of H_γ. In the fields ranging from 2000 volts to 70,000 volts per centimeter in strength, the manner of decomposition of the following seven lines has been examined: λ in A.°U. 5048, 5016, 4922, 4472, 4388, 4121. The results of the measurements have been compared with those of Stark, Brunetti and Koch. In each of the p— and s— components of the three lines 4922, 4472 and 4388 A.°U., an isolated component appeared on the violet side at a certain electric field, and in the case of 4472 line the component was further decomposed into three as the field strength was increased. Besides the lines mentioned, the separation of the p— component of the line 4686 has been observed. One of the new lines found by Koch has also been observed. Excepting the line 4686, the mode of decomposition of all the helium lines examined has been found to be dissymmetrical with respect to the initial line.—*Memoirs of the College of Science*, Kyoto Imperial University, October, 1917.

Selenium Rectifier.—H. GREINACHER.—If a direct current is sent through a selenium cell, and an alternating current is then superimposed upon the direct current, the latter is increased. An alternating current only produces a direct component when it ceases to be sinusoidal. The author attributes both effects to the variation of resistance of selenium with the voltage, which he assumes to be a linear relation. He gives a theory of the rectification and deduces the value $KV^2/W(1-KP)^2$ for the rectified current, where V is the effective alternating-current voltage, P the original direct-current voltage, K the coefficient of the voltage effect, and W the resistance of the selenium cell at voltage P. The author showed a battery capable of impressing a continuous voltage of 6000 when fed by an alternating current.—*Science Abstracts, Section A*, May 31, 1918 (abstracted from *Archives des Sciences*, December, 1917.)

Miscellaneous

The Electrically Equipped Tractor.—GEORGE B. STONE.—The article gives a description of an electric tractor for farm work.—*Tractor and Gas Engine Review*, June, 1918.

A Self-Adjusting Spring-Thrust Bearing.—H. G. REIST.—Bearing troubles are usually due to the fact that the oil film is broken in spots by uneven contact, the film of oil being only two or three ten-thousandths of an inch in thickness for a pressure of about 100 lb. per square inch (7 kg. per sq. cm.). A careful study of bearing difficulties led to the design of a flexible bearing surface pressed against the runner by springs. It appears that this would prevent the possibility of undue pressure at any point and compel each element of the surface to carry the load. Under test this solution has proved satisfactory. The pressure usually allowed for these flexible bearings is from 300 lb. to 400 lb. per square inch (21 kg. to 28 kg. per sq. cm.), the design permitting a very thin oil film without metallic contact. It is of course desirable to operate bearings at high pressure, for the parts are smaller and the friction is very much reduced. Tests to show the advantage of higher pressure in bearing designs are presented by the author as follows: By cutting the bearing surface in half, thus doubling the pressure per unit area, the bearing friction loss was reduced from 38 kw. to 16.7 kw. It is suggested that the principle described, although applied to thrust bearings, is applicable also to journal bearings and to bearing surfaces having a reciprocating motion.—*General Electric Review*, July, 1918.

Insulating Material from Fish Offal.—A new Danish process by which certain by-products valuable for electrical insulation may be made out of fish offal is soon to be put to a practical test in Skagen, Denmark. The most important of the new products is called "cornimit." It is claimed that this material has less water-absorbing capacity than galalith and greater insulating resistance. The price of the finished product is calculated at 11d. per kilogram (10 cents per pound).—London *Electrical Review*, June 7, 1918.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

CURTAILING ELECTRICITY IN PARTS OF CALIFORNIA

Signs and Breweries Come First in Order for Reduction Issued by the State Power Administrator

To cut down the use of the drought-depleted supply of electricity in northern and central California, and to save electric power for war industries, Power Administrator H. G. Butler on July 18 issued an order eliminating during the months of August and September, except Saturdays, Sundays and legal holidays, the use of electricity for signs or displays of any kind. Breweries, beginning Aug. 1, are to be furnished with only half their average monthly consumption of electricity for power. Street railroads are to reduce their mileage to bare necessity and to make skip stops instead of at every crossing. Interurban electric lines are to reduce consumption as much as possible. City officials are asked to reduce street and other lighting to the minimum compatible with public safety.

GOVERNMENT TO CONTROL THE TURBINE SITUATION

Meetings in Washington This Week to Perfect Details—War Industries Board to Commandeer All Large Units

Representatives of the large turbine producers of the United States like the General Electric Company, the Westinghouse Electric & Manufacturing Company, the Allis-Chalmers Manufacturing Company, etc., have been and are still meeting in Washington with the electrical division of the War Industries Board, Walter Robbins chairman, for the purpose of arranging certain details under which the government has commandeered all large turbines in sight and will take control of the turbine situation.

Under the arrangement being made, any one in the market in the future for turbines must apply to the War Industries Board for permission before a purchase can be made. This is made necessary by the shortage in turbines and in power, particularly in what is known as the restricted power district of the East, and it is the intention of the War Industries Board to see that turbines in future are placed where they will do the most good in furnishing power.

Steam turbines are badly needed, especially to meet the requirements of the Emergency Fleet Corporation and the Navy Department.

It is said in Washington that twenty-one manufacturers of turbines will be affected by the order and that manufacturers of turbines under 700 hp. will not come under the control of the War Industries Board. When this issue of the ELECTRICAL WORLD went to press, it was expected in Washington that a formal announcement by the board would be made public almost immediately.

L. K. COMSTOCK IS NOW IN GOVERNMENT SERVICE

New York Man Giving All of His Time to Work on the Priorities Committee of the War Industries Board

L. K. Comstock of L. K. Comstock & Company, New York, is at present devoting all of his time to work on the priorities committee of the War Industries Board and is devoting particular attention to work in connection with the non-ferrous tube section of the finished products division.

The work in this section is intended to control and at the same time increase the supply of seamless brass and copper tube, in which there is a distressing shortage, particularly in that kind of tube required for vessels of the navy and Emergency Fleet Corporation.

SUPPLY JOBBERS APPOINT WAR SERVICE COMMITTEE

Executive Committee of the National Association Has Drawn Up Distribution Pledge Subject to Revision

On Wednesday and Thursday the executive committee of the Electric Supply Jobbers' Association met at the Hotel Belmont, New York City, to ascertain the position of the electric supply jobber with respect to the war service pledge of the manufacturers. At this time a jobber's pledge, which accomplishes the same thing for the government as the manufacturer's pledge, was drawn up subject to revision. A war service committee of the E. S. J. A. was appointed, consisting of W. E. Robertson, Buffalo, N. Y., chairman; F. M. Bernardin, Kansas City, Mo.; W. R. Herstein, Memphis, Tenn.; F. S. Price, Boston, and N. G. Harvey, Chicago.

If it be true that no asset of a public service company to-day is more valuable to it than the good will of the community it serves, I am sure it is equally true that no public service company can perform its duties unless there is not only loyal service on the part of its employees but mutual confidence on the part of men and officials, together with adequate opportunities for direct approach by the men to officials in whom true authority is vested.—*Henry B. Endicott, executive manager Massachusetts Public Safety Committee.*

THE ENGINEER'S RELATION TO SALES DISTRIBUTION

Conference Club of Contractors Discusses Broad Commercial Problems with Representatives of Consulting Engineers, Manufacturers and Contractors

The functions of the engineering contractor, the consulting engineer, the jobber and the manufacturer's sales engineer were discussed at the eighth meeting of the Conference Club, held at Schenectady, July 21, 22 and 23. Representatives of the Westinghouse Electric & Manufacturing Company, General Electric Company. Electric Cable Company, American Conduit Company and National Metal Molding Company were present, in addition to members of the Conference Club.

A paper by Sullivan Jones, "A Functional Reorganization of the Electrical Industry," presented the basis for prepared discussions which were read by J. M. Curtin, manager industrial department Westinghouse Electric & Manufacturing Company; by A. R. Bush, manager power and mining department General Electric Company, and by C. E. Knox, presenting the viewpoint of a group of consulting engineers from New York.

Mr. Jones' paper proposed a plan by the Conference Club for effecting a readjustment of the engineering functions of the manufacturer, the contractor and the consulting engineer and suggested that the electrical contractor is really a constructing engineer.

Mr. Jones pointed out that the whole philosophy of business is changing and that men are giving up traditional viewpoints of their relations with each other in industry. Mr. Jones' paper was a plea for a better recognition, on the part of each branch of the industry concerned, of the problems of the others, leading toward the elimination of certain difficulties which arise when one group in the industry performs the work of another.

A broad discussion developed around several questions. Can the consulting engineer take the place of the sales engineer of the manufacturer? What service does the contractor-engineer render which should be performed by the consulting engineer? What should be the relation between the sales engineer, the consulting engineer and the engineering service performed by the contractor?

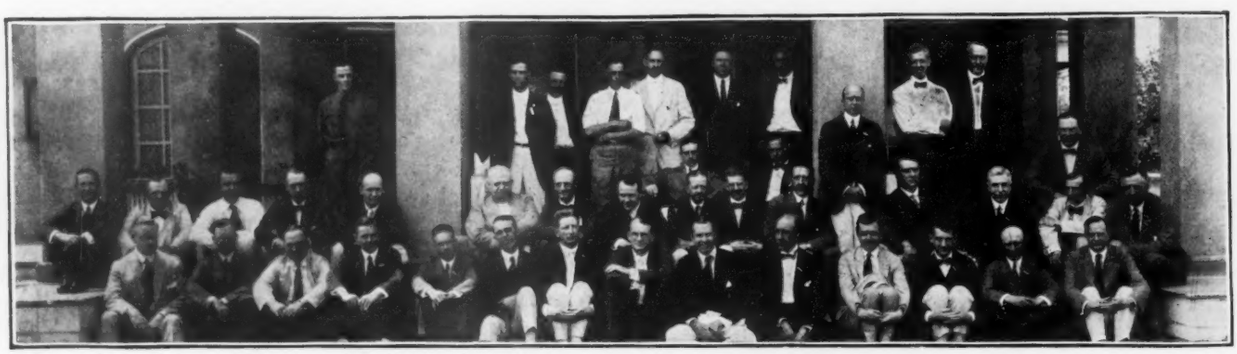
The paper aroused a broad discussion and brought out particularly two main points—first, that there are two classes of engineering business—development engineering, in which the manufacturer creates business, and the consulting service, which is the pure engineering side of the work for the user. The second general point is that a distinction should be made as to volume of work done in each of these classes of engineering. The larger proportion of the work handled by the manufacturers through the sales engineers is standard or semi-standard in character, and the applications of electricity are made according to well-established and generally understood good engineering practice. It was stated, therefore, in discussing this question, that there was a difference between the consulting work of a pure engineering character and standard engineering practice as defined above.

Mr. Curtin opened the discussion and said that no plan will succeed unless it provides that the final buyer shall get his wants supplied easily and satisfactorily at lowest costs. He outlined the classes of expert engineering service which the manufacturer had developed in order to apply electricity to the many arts and industries. He questioned the practicability of the consulting engineer knowing enough about the lines of the manufacturer to function as completely as the paper suggested.

Mr. Bush called attention to the difference in volume and also indicated that there were wide differences in the distribution of supplies and heavy equipment. He made the general point that in discusssing these problems care should be taken not to introduce extra men between producers and final buyers and to assure that essential service be the basis for a development of the engineering functions.

James R. Strong, in the general discussion, accepted the point of view of the paper in so far as it set up high standards for discussion. He expressed the opinion that it was not practicable, because of the wide variation in trade practices and standards, to outline and define the function of the different groups with relation to each other. He made the point that in addition to the sales engineer of the manufacturer and of the consulting engineer and of the engineering service department of the contractor, the central station also in many communities has sales engineers whose function in helping the manufacturer to apply electricity is not greatly different from that of the consulting engineer.

Mr. Strong expressed his belief that the broad way to approach the problem was through the general suggestion made in the so-called Goodwin plan. He believed that if each of the groups in the industry that had a relation to this problem would intelligently analyze what it is doing and make a charge for the service which it is rendering, the problem would in general take care of itself because of the natural competition. If a man understood intelligently that he was rendering engi-



BETWEEN SESSIONS AT THE CONFERENCE CLUB MEETING AT SCHENECTADY, N. Y.

neering service and charged for it, he would not compete unfairly in the open market with the engineer who sold service only and was not a constructing engineer.

Representatives of the Consulting Electrical Engineers' Council of New York were present and presented a written discussion read by C. E. Knox. They expressed the conviction that the Conference Club plan was fundamental in character, and that while the plan seemed idealistic it must not therefore be thought impracticable. They suggested the appointment of a committee of manufacturers, consulting engineers and contractors to discuss the many questions involved and to forward the general movement.

A paper by E. Ellinger of L. K. Comstock & Company, New York, on "Credits" was read. The details of this paper and further discussion by other members of the conference will be presented in a later issue of the ELECTRICAL WORLD.

The Conference Club voted to appoint the necessary committees to discuss the many phases of the questions brought out by the paper, and it was voted to hold the next meeting of the Conference Club on Oct. 17, 18 and 19 at Pittsburgh.

On Tuesday evening an informal dinner was given by the General Electric Company to the Conference Club and their guests, at which J. R. Geary, a representative of the General Electric Company in Japan, presented a most interesting talk on the soundness of the relations between this country and Japan, saying that, after fifteen years of personal experience, he felt that the Japanese were in accord with the war policies of the United States and that there was no basis for the wrong thinking with regard to Japan which he had heard expressed from time to time in this country.

The General Electric Company presented a cup for a golf trophy which was competed for, with the president's cup, by members of the Conference Club and guests. The General Electric cup was won by T. H. Hatfield of Indianapolis and the president's cup by G. E. Stuart of L. K. Comstock & Company.

PROBLEM OF ENEMY SUBMARINE

Information from the Naval Consulting Board and the War Committee of Technical Societies

"The Enemy Submarine" is the title of Bulletin No. 2, compiled by the Naval Consulting Board and the war committee of technical societies. Prepared from information already published and other information released recently, the publication has been examined and authorized by Secretary of the Navy Daniels.

CLOSING MEETING OF THE CONTRACTORS AND DEALERS

Last Session of Cleveland Convention—Discussion of Executive Committee on Relations with the Jobber

At the closing meeting of the eighteenth annual convention of the National Association of Electrical Contractors and Dealers at Cleveland, Ohio, papers on credit and accounting, retail merchandising and farm lighting were read, and a talk on "The Real Causes of Prosperity and Depression" by George E. MacIlwain, of Babson's Statistical Organization, was given. A report of the early sessions was published in last week's issue of the ELECTRICAL WORLD.

The association voted to hold its next annual convention in Milwaukee, and the executive committee accepted the invitation of the Toronto contractor-dealers to hold its meeting in that city in October.

Roy Woolley of the Society for Electrical Development presented the plans of the society for promoting an outlet campaign. Much informal discussion by the contractor-dealers present indicated their interest and their belief in the value of this campaign at this time.

At a meeting of the executive committee with a committee from the Electrical Supply Jobbers' Association composed of W. E. Robertson of Buffalo, Frank S. Price of Boston and Fred Bissell of Toledo there was a discussion of the relation between the jobber and the contractor-dealer. The discussion was led by W. K. Tuohey, chairman of the co-operation and harmony committee formed at the request of the National Association of Electrical Contractors and Dealers with the Electrical Supply Jobbers' Association on May 19. Another member of the contractors' committee, James R. Strong of New York, also discussed the question, and a general discussion by members of the contractors and dealers' association followed.

In the resolution of co-operation which was drawn up as a result of the first meeting of the committee it was stated that the members of the association personally and through their salesmen urge all electrical contractors and contractor-dealers to become members of the contractors' association and urge all electrical dealers and all other merchants operating retail electrical departments to become associate members.

To help clear up any misunderstanding as to the meaning of the terms "retail department" and "retail business," the resolution defined "retail department" as follows:

"By retail departments operated by jobbers your committee understands departments that sell at retail prices,

DELEGATES AND GUESTS AT CLEVELAND MEETING OF CONTRACTORS AND DEALERS

in retail quantities, to the consumer, and expressly excludes sales to isolated plants, central stations and power companies, philanthropic, educational, health or corrective institutions or enterprises related thereto, industrial firms or corporations of every kind engaged in commerce or in undertakings relating thereto, or the government, or any political subdivision thereof or agency in connection therewith."

The discussion on the resolution hinged on the definition of what was understood by retail business. The general basis for further agreement on the question was established in the discussion along the lines of the idea that decisions with regard to who shall handle business ought to be based upon the general platform of who creates business. In his remarks Mr. Robertson made the point that profit comes from sales effort and that it is not possible arbitrarily to classify men in groups without regard for the ability of the men in those groups to perform the functions of the groups. It was pointed out that both jobbers and contractor-dealers could agree at once to the platform laid down that the field for household appliances was a primary retail field. Mr. Robertson and others discussing the question made it clear that the volume of business possible in this market was not generally realized and that there existed a very real opportunity, particularly in the labor-saving appliance field, for the contractor-dealer to go out and create business locally which would return to him a real profit.

In the discussion of the papers on retail merchandising and farm lighting the fact was brought out that contractor-dealers who have taken advantage of the possibilities of the sales offered by appliances have profited. It was pointed out that the traditional point of view that there was no money in the retail business was a mistaken one, and examples were given showing large volumes of sales profitably made with several of the motor-driven appliances.

Another point made in the discussion was the possibility of developing local effort along the line of securing a better understanding locally of the relation between the different forces for building good retail business. References were made to the success of this plan of co-operation on the Pacific Coast, and to the success of the general ideas laid down by W. L. Goodwin in many cities since the New Orleans convention of the contractor-dealers' association. Opportunity was given the contractor-dealers' association to have contributing members on the basis of the resolution passed at the convention, and at the final executive meeting the plans and methods of financing the association were taken up.

It is good business at all times to use as little power as possible. It is patriotism to do so now, as war industries must be protected against any hindrance to full operation. A considerable voluntary reduction in the consumption of electric energy made at this time will certainly reduce the extent to which priorities may be applied. It may make a priority list unnecessary in the future and assuredly will postpone the evil day in any event.—*H. G. Butler, Power Administrator under the California Railroad Commission.*

STRIKE AT LYNN WORKS OF GENERAL ELECTRIC COMPANY

Still "On" Officially, but Employees Are Returning and Sentiment Is Against Curtailment of Production in War Time

Although the strike of employees at the Lynn (Mass.) Works of the General Electric Company was still "on" Wednesday and the production of war material and other essential equipment correspondingly retarded, men were returning to work and sentiment was setting strongly against remaining out of the factory at this vital time in the country's history.

The walk-out occurred without notification to the company's officials on Monday of last week, and without the presentation of any reasons or requests by employees. About 75 to 80 per cent of the employees at the Lynn Works stopped work. The company is manufacturing much important war material for the government. Public sentiment clearly opposes a continuance of the strike and has, in fact, not favored the walk-out at any time.

Several days after the walk-out the strike committee addressed a letter to W. C. Fish, general manager of the Lynn Works, in which various demands were framed. These included a basic eight-hour day, double time for Sunday, holiday and after-midnight work, the elimination of physical examinations of applicants for employment, and the establishment of various wage and working conditions along lines in force elsewhere. The strike leaders wired President Wilson last week that they desired to have the National War Labor Board act as arbitrator.

General Manager Fish also telegraphed the President, calling attention to the violation by the strike leaders of the first principle of the National War Labor Board, promulgated by the President's proclamation of April 8, 1918, to wit: "There should be no strikes or lock-outs during the war," pointing out that this principle is the fundamental basis of the agreement between the employers and the workers, and recognized as vital to the successful prosecution of the government's war work; that the employees left without notice or presenting reasons or requests, and production stopped.

Mr. Fish emphasized that this was expressly contrary to the war policies of the government and urged that the men should go back in compliance with such a policy. The telegram stated further that when the men are back and present their requests these will be carefully considered with the employees, and if an agreement is not reached, it will be in accordance with the principles of the War Labor Board to submit the matter. Mr. Fish expressed his firm belief in the loyalty of the employees and stated that he would be their stout defender on this point, no matter how unwisely they may be advised.

On Tuesday the State Board of Conciliation and Arbitration announced that by request of President Wilson it would order public investigations of existing strikes in Lynn and other industrial centers of New England unless all the existing strikes were settled within twenty-four hours.

There appeared to be no disposition on the part of the federal authorities at the beginning of the week to undertake the arbitration of the Lynn strike, in view

of the false position which the strikers took at the outset and which they have since maintained. The employees have begun to go back in considerable numbers, although the excessively hot weather has doubtless led many of them to prolong their absence from work.

TELEGRAPH AND TELEPHONE TAKEN BY THE GOVERNMENT

President Wilson by Proclamation Takes Over Systems for Operation During the War—Postmaster-General Burleson in Charge

President Wilson's proclamation of July 23 recites that "it is deemed necessary for the national security and defence to supervise and to take possession and assume control of all telegraph and telephone systems and to operate the same in such manner as may be needful or desirable."

By his sweeping proclamation effective at midnight on July 31, the President takes possession and assumes "control and supervision of each and every telegraph and telephone system, and every part thereof, within the jurisdiction of the United States, including all equipment thereof and appurtenances thereto whatsoever, and all materials and supplies."

The supervision, possession, control and operation undertaken by the President shall be exercised by and through Postmaster-General Burleson, who "may perform the duties hereby and hereunder imposed upon him, so long and to such extent and in such manner as he shall determine, through the owners, managers, boards of directors, receivers, officers and employees of such telegraph and telephone systems."

Until and except so far as the Postmaster-General shall by orders otherwise provide, the owners, managers, boards of directors, receivers, officers and employees of the various systems shall continue operation in the names of their respective companies, associations, organizations, owners or managers.

Regular dividends hitherto declared and maturing interest upon bonds, debentures and other obligations may be paid in due course; and such regular dividends and interest may continue until and unless the Postmaster-General shall otherwise by order determine. Subject to the approval of the Postmaster-General, the various systems may determine upon and arrange for the renewal and extension of maturing obligations.

Postmaster-General Burleson announced that John C. Koons, First Assistant Postmaster-General; David J. Lewis, Commissioner United States Tariff Commission, and William H. Lamar, solicitor for the Post Office Department, are appointed a committee for the governmental management, operation and control of the telegraph and telephone systems, of which committee the Postmaster-General shall be chairman.

In a formal statement Mr. Burleson said in part:

> The telegraph and telephone service, as conducted by those who have had the responsibility under conditions heretofore existing, has been remarkably successful considering the unusual additions to their task and the unprecedented difficulties in the way of its full performance which have arisen out of the war—difficulties which could be overcome only by a unity of administration, particularly a unification of the use of the telephone and telegraph lines, which could not be realized without the aid of the government
>
> Under the President's order conditions are changed and greater opportunity is afforded to effect improvements and economies and a larger use by the people of these facilities which have become an imperative need in their everyday life. Whether advantage can be taken of these opportunities to improve this service to the public remains to be disclosed by experience. Every effort of the department will be directed to the accomplishment of this end.
>
> It will be the purpose of the Post Office Department to broaden the use of the service at the least cost to the people, keeping in mind that a high standard of efficiency must be maintained. I shall avail myself of an early opportunity to consult with those who have heretofore had the responsibility of directing the affairs of the various wire systems taken over, and I doubt not will be greatly benefited by suggestions they may be kind enough to offer me.

Cable and radio systems are not covered by the proclamation, but it is reported that they will be taken later.

WAR ORGANIZATION OF THE ELECTRIC FURNACE MAKERS

Electric Furnace Industries War Service Committee Organized to Assist the Government War Program

A meeting was held recently at the Yale Club, New York, of certain electric furnace manufacturers of the United States at the request of the General War Service Committee of the Electrical Manufacturing Industry. C. L. Collens, 2d, representing the General War Service Committee, presided.

A temporary committee composed of John G. Bergquist of the Hamilton & Hansell Company, John A. Dixon of the John A. Crowley Company and F. J. Ryan of the Electric Furnace Construction Company was appointed to notify all of the manufacturers of the intention to form such an organization. F. J. Ryan was nominated as chairman of this committee.

As a result a final meeting was held on June 26 at a luncheon at the Bankers' Club, New York, and the movement was firmly ratified and a permanent committee organized, the members of which are: G. H. Clamer, chairman; John G. Bergquist, C. B. Fletcher, S. N. Castle, and F. J. Ryan, secretary.

The concerns that so far have joined this organization, which is to be known as the Electric Furnace Industries War Service Committee, are as follows: Hamilton & Hansell Company, New York; John A. Crowley Company, New York; Ajax Metal Company, Philadelphia; American Metallurgical Corporation, Philadelphia; Electric Furnace Construction Company, Philadelphia; Pittsburgh Furnace Company, Pittsburgh; Booth-Hall Furnace Company, Chicago; Industrial Electric Furnace Company, Chicago; C. W. Leavitt & Company, New York; Ludlam Electric Furnace Company, New York; T. W. Price Engineering Company, New York, and Beekman & Linden Corporation, San Francisco.

The object of the Electric Furnace Industries War Service Committee as formulated by its members is the formation of an organization for the duration of the war, or for such a length of time as it is apparent that there is a necessity for it by the government, to compile and detail information pertaining to the electric furnace industries in connection with steel, non-ferrous alloys and metals in general where the melting problem is concerned.

"LIGHTLESS NIGHTS" ARE ORDERED AGAIN

Eastern Manufacturing Zones Have Four Prohibited Nights Weekly, Other Sections Two Nights, in Fuel Administration's Regulations

The United States Fuel Administration made public on July 19 an order, effective July 24, restricting the use of fuel for outdoor illumination.

Light generated or produced by the use or consumption of coal, gas, oil or other fuel for illuminating or displaying advertisements, announcements or signs, or for the external ornamentation of any building, will be discontinued entirely on Monday, Tuesday, Wednesday and Thursday of each week within New England and the States of New York, Pennsylvania, New Jersey, Delaware, Maryland and the District of Columbia, and will be entirely discontinued on Monday and Tuesday of each week in all the remainder of the United States. The order excepts bona-fide roof gardens and outdoor restaurants and outdoor moving-picture theaters.

Street illumination in all cities will be restricted to the hours between sunset and sunrise, and the amount of public lighting in any city will be reduced to that necessary for safety. The order charges local fuel administration officials to arrange with municipal authorities for public lighting regulation.

The use of light for illumination or display in shop windows, store windows or in signs in show windows will be discontinued from sunrise to sunset and will be discontinued entirely on the "lightless nights."

The Bureau of Standards has advised the Fuel Administration that it is estimated that about 500,000 tons of coal per year is used for advertising purposes, including display and show-window lighting, in the United States. Similar estimates fix the amount of coal used in advertising lighting in New York City at 16,000 tons per year.

The order reads:

It appearing to the United States Fuel Administrator that it is essential, in furtherance of the national security and defense, the successful prosecution of the war and the support and maintenance of the army and navy, to lessen and prevent the waste of fuel, and to secure an adequate supply and equitable distribution and prevent, locally and generally, scarcity thereof, and that to these ends it is necessary that the use of fuel shall be limited and restricted in the manner hereinafter set forth,

The United States Fuel Administrator, acting under authority of an executive order of the President of the United States, dated Aug. 23, 1917, appointing said administrator, and of subsequent executive orders, and in furtherance of the purpose of said orders and of the act of Congress therein referred to and approved Aug. 10, 1917,

Hereby adjudges that in his opinion the use of fuel or of light generated or produced by the use or consumption of fuel for any of the purposes hereinafter described, except as hereinafter provided, is wasteful, and that any person using fuel or light for such purposes, except as aforesaid, is engaging in a wasteful practice or device in handling or dealing with fuel, and that the use of fuel or light for such purposes except as aforesaid is prejudicial and injurious to the national security and defense, and a cause of scarcity locally and generally, and said United States Fuel Administrator hereby orders and directs that, until further or other order of the United States Fuel Administrator, and subject to modification hereafter from time to time and at any time:

1. No city, village or town, and no person, firm or corporation under any contract with any city, village or town, shall use or consume any coal, oil, gas or other fuel for the maintenance of lights in the streets, parks or other public places of such city, village or town, except under the following restrictions and limitations:

(a) Street illumination automatically lighted, maintained by or for any such city, village or town, in the streets, parks or other public places thereof, shall not be lighted before sunset and shall be turned out not later than sunrise.

(b) Street illumination lighted by hand in any such city, village or town shall conform as nearly as may be to the requirements hereinabove prescribed for automatic lights.

(c) The amount of public lighting in any city, village or town shall be only so much as may be necessary for safety, and the use of lights commonly known as cluster lights for purposes of display or decoration shall be reduced to such portion only of the cluster as is necessary for safety.

2. The local fuel administration for the territory within which any city, village or town is located shall arrange with the proper municipal or town authorities of such city, village or town for the regulation of public lighting in accordance with the provisions of paragraph 1 of this order. Regulations for public lighting so arranged shall in each case be subject to the approval of the proper state fuel administrator, and in case regulations in accordance with said paragraph 1 for the public lighting of any city, village or town satisfactory to the state fuel administrator of the state within which the same is located shall not have been arranged between the local fuel administration and the proper municipal or town authorities, as hereinafter provided, within ten days from and after the effective date of this order, said state fuel administrator is hereby authorized and directed to prescribe such regulations for such city, village or town, and the same shall be valid and binding.

3. Out-door lights within a city, village or town, other than those mentioned in paragraph 1 of this order, which involve, directly or indirectly, the use or consumption of coal, oil, gas or other fuel shall not be lighted until thirty minutes after sunset.

4. (a) The use of light generated or produced by the use or consumption of coal, gas, oil or other fuel, for illuminating or displaying advertisements, announcements or signs, or for the external ornamentation of any building, shall be entirely discontinued on Monday, Tuesday, Wednesday and Thursday of each week within New England and the States of New York, Pennsylvania, New Jersey, Delaware, Maryland and the District of Columbia, and shall be entirely discontinued on Monday and Tuesday of each week in all the remainder of the United States.

Exception: Bona-fide roof gardens where meals are served and out-door restaurants, also establishments devoted exclusively to the exhibition of out-door moving pictures at which admission is charged, are exempt from this section.

(b) The use of light generated or produced by the use or consumption of fuel for illuminating or displaying any shop windows, store windows or any signs in show windows shall be discontinued from sunrise to sunset and shall also be discontinued on the nights specified in paragraph 4 (a).

5. The state fuel administrators within the several states are hereby directed and authorized to see that the provisions of this order are observed and carried out within their several states, to report violations thereof to the United States Fuel Administrator, and to recommend to him action to be taken with respect to such violations.

This order shall be effective on and after July 24, 1918.

LAMPS UNDER CONSIDERATION

It is understood that the Fuel Administration has under consideration some measures providing for the possible curtailment of production and distribution of the less efficient types of incandescent lamps. It is also proposed to take steps to discourage the wasteful and unnecessary use of electrical energy for lighting purposes.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month on the next-to-last text page.

N. E. L. A., Philadelphia Section.—At a recent meeting officers for the Philadelphia Section, N. E. L. A., were elected for the ensuing year, W. K. Kerford becoming chairman and F. X. Monville secretary.

Jovian Electric League, St. Louis.—The election of officers of the St. Louis Jovians for next year resulted as follows: President, E. H. Waddington, Western Electric Company; secretary, G. McD. Johns.

A. I. E. E., Indianapolis-Lafayette Section.—The annual election of officers, held July 3, resulted as follows: Chairman, G. B. Schley, and secretary, C. F. Harding. Mr. Harding's address is Purdue University, West Lafayette, Ind.

Oregon Association of Electrical Contractors and Dealers.—Secretary-treasurer J. W. Oberender, 302 Dekun Building, Portland, Ore., reports that the annual meeting of the association will be held Sept. 12, 13 and 14, 1918.

Electric Hoist Manufacturers' Association.—The June meeting of this association was held at Montour Falls, N. Y. The general topic was war service, along lines for co-ordinating the facilities of electric hoist manufacturers so as to be of most direct service to the government.

A. I. E. E., Philadelphia Section.—An interesting summary of the work of the A. I. E. E. in connection with the war was given by F. L. Hutchinson, national secretary, at the Philadelphia Section meeting, June 10. W. F. James was elected chairman and E. B. Tuttle secretary for the year 1918-19.

A. S. M. E., New Orleans Section.—At a joint meeting of the local section of the A. S. M. E. and the Louisiana Engineering Society recently a paper was read by Howard Egleston, civil and industrial engineer for the New Orleans Association of Commerce, entitled "The Present Situation as Relates to Introduction and Use of Natural Gas in New Orleans." J. M. Morris is secretary of the Louisiana Engineering Society.

Central Electric Railway Association.—The annual summer meeting of the Central Electric Railway Association was held at Cedar Point, near Sandusky, Ohio, on July 17 and 18. G. Dorticus, General Electric Company, outlined the history of automatic substation developments. Other papers on general business policy were discussed. It was announced that the next meeting of the association would be held at Indianapolis, Nov. 21.

A. I. E. E., Pittsburgh Section.—On June 11 officers were chosen for the ensuing year as follows: W. R. Work, chairman, and J. G. Carrol, secretary. Major Lyle read a paper on "The Development Organization of a Modern Army," and S. Q. Hayes spoke on "Some Recent European Experiences."

Indiana Electric Light Association.—The annual convention of the association will be held at the Claypool Hotel, Indianapolis, on Wednesday, Aug. 7, 1918. Instead of having the usual three days' session, all business and papers will be confined to one day in the interest of economy appropriate to the times.

United States Independent Telephone Association.—War problems of telephone companies formed the chief theme for discussion at the annual convention of the independent telephone men held in Chicago, June 25 to 28. Officers were re-elected for the following year. G. H. Robinson of St. Paul is president.

A. I. E. E., Toledo Section.—The meeting of June 28 was attended by eighty members of the Toledo University detachment of gas-motor experts to listen to a paper by Captain Arthur Boor, R. A. F., on "Development of Aviation Motors." The speaker traced the development of motors up to the present types.

Society for the Promotion of Engineering Education.—The twenty-sixth annual meeting of the Society for the Promotion of Engineering Education was held at Northwestern University, Evanston, Ill., June 26-29, with an attendance of 125, representing forty institutions. The subject of the meeting was "Engineering Education and the War." The War Department was represented by Dr. J. R. Angell, C. R. Mann and S. P. Capan. Dr. Angell spoke at length on the committee of education and special training and emphasized the excellent relations which have been established between the engineering schools and the War Department. There were three papers describing this type of work which caused a great deal of interest. One of the most important subjects before this convention was the question of attendance at engineering schools next year. This was discussed at length by Dr. Mann, representing the committee on education and special training of the War Department, under the title "Students' Army Training Corps." Dr. Capen read a paper on the "Relation of the Bureau to the War and to Engineering Schools." The report of the standing committees occupied practically one day. The joint session of the Western Society of Engineers, the Chicago Sections of the A. S. M. E. and A. I. E. E. and the S. P. E. E. on Thursday night was a success in every way. A. S. Baldwin, chief engineer Illinois Central Railroad, presided. The presidential address, "Essentials in Engineering Education," was read by Vice-president John F. Hayford in the absence of President Milo S. Ketchum.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Act Done Prior to Court Order Not Contempt.—A charge that defendant was maintaining electric wires within a stated distance from plaintiff's wires, in violation of an order enjoining defendant from trespassing upon poles or wires of plaintiff and from constructing lines within such distance therefrom, does not constitute a charge of contempt, since the wires may have been so placed prior to the promulgation of the order, the Court of Appeals for the Second District of California held (173 P. 110).

Complaint for Damages for Line Maintenance.—A complaint by an abutting property owner against a telephone company for damages for the maintenance of a telephone line erected over such property before plaintiff became the owner thereof is demurable where it merely states that plaintiff had not given his consent but does not allege that consent to the maintenance of the lines was not given by plaintiff's predecessor in title, in view of the laws requiring the approval of the Public Utilities Commission where the consent of the adjoining owner cannot be obtained and providing for a committee to appraise damages for the maintenance of the lines, the Supreme Court of Errors of Connecticut held (103 A. 754).

Negligence in Distributing Energy Over Uninsulated Wire on Premises of User.—Where an electric company knew that the insulation was burned off a wire on the premises of a user beyond its meter, and sent a current over the same of such voltage as to cause death to a person coming in contact therewith, the jury was authorized to find that it was negligent, the Court of Civil Appeals of Texas held in International Electric Company versus Sanchez (203 S. W. 1164). The fact that the owners of the building knew of the uninsulated condition of a wire and failed to remedy the defect cannot be held such an intervening cause of the death of one coming in contact therewith as to require a finding that the negligent act of the electric company in sending a high-voltage current over the wire after knowledge of its condition was too remote. Where deceased had no knowledge of the existence of an uninsulated wire and stepped upon a parapet in a building, which act would have involved no danger had the wire not been there, and where he was not then trespassing to any appreciable extent on the rights of any other person, he was not guilty of contributory negligence as a matter of law.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Commission Upheld in Missouri Rate Case.—The Supreme Court of Missouri has decided in favor of the Kansas City Light & Power Company the suit of the Kansas City Bolt & Nut Company attacking the increased rates put into effect on May 1, 1917. These rates were established by the Missouri Public Service Commission, the decision being an indorsement of the commission's authority to fix the rates.

French Celebrate Fourth of July.—Le Carbone company, a French concern with wide American affiliations, manufacturing carbon brushes, has sent the following cable to its representative in the United States, W. J. Jeandron, New York City, showing the great ties of friendship which bind the French and American republics together: "Advise all our friends what admiration and gratitude France is feeling for the gigantic effort of sister republic. Thursday, July 4, was also our national day."

The Cincinnati Rate Case.—An article on Cincinnati rates, published in the ELECTRICAL WORLD of July 6, 1918, page 34, may serve to give an unintentional erroneous impression as to the facts. The recent decision of the Ohio Supreme Court does not in effect serve to deny the right of the Union Gas & Electric Company to increase its rates for natural-gas service, but, on the contrary, will, in the opinion of counsel, serve to put into effect the ordinance passed in 1916 increasing the net rate for natural gas to 35 cents per 1000 cu. ft. from 30 cents as formerly charged. This 35-cent ordinance was voted down in a referendum election by the Cincinnati voters, and, following such action, a new ordinance fixing a rate of 30 cents was passed by the Cincinnati City Council with the avowed purpose of transferring the fixing of the rate to the Public Utilities Commission of Ohio under appeal to be taken by the company. The decision of the Ohio Supreme Court, referred to in the article, holds that the utilities commission has no jurisdiction in this case because in the franchise of the company relating to natural-gas service the fixing of rates rests with the city, and the court holds that this franchise constitutes a contract obligation between the city and the company which is not affected by subsequent legislation, and that therefore the authority of the Public Utilities Commission, which commission was created under subsequent legislation, does not apply during the life of the twenty-five-year contract between the company and the city. This ruling of the court will serve also, in the opinion of counsel, to set aside the referendum election in which the 35-cent rate ordinance was rejected because such election was held under legislation also subsequent to the making of the twenty-five-year contract. If this interpretation of the court's decision is correct, the first effect will be to sustain the company's present rate of 35 cents for natural gas for a further period of three years against the attempt on the part of the city to enforce a maximum rate of 30 cents. The effect of the decision secondarily will be to take away from the Ohio Public Utilities Commission any jurisdiction over the gas rates of the company until the year 1930. As to electric rates, the statement in the article is correct as applied to the present maximum rate of 8½ cents per kilowatt-hour, but it will be interesting to note that a surcharge of 20 per cent on the company's wholesale lighting and power schedules became effective March 6 last with the approval of the Ohio commission, and such rates are in no way affected by the recent court decision. The contentions of counsel for the company in respect to the effect of the court decision have been sustained in the federal court by temporary injunction pending formal argument which will not be heard before October.

Southern California Edison Seeks Rate Increase.—The Southern California Edison Company has filed with the California Railroad Commission an application for authority to increase its rates for electricity to general consumers. No definite raise is asked, the request being simply that the commission authorize such increase in electric rate as the commission may deem proper. A statement attached to the application sets forth that as the result of the high operating cost, the shortage of water power and other reasons the company's revenues are not adequate at existing rates to maintain service at maximum efficiency and enable it to perform the public service required of it. The Southern California Edison company makes a statement by its president, W. A. Brackenridge, as follows: "Practically every utility in the state has found it necessary to apply to the Railroad Commission for increases in its rates, owing to conditions brought about by the war. The Southern California Edison Company has not made application before this, having waited until such time as it could definitely determine what effect the shortage of water and the increased cost of fuel oil, labor and supplies would have upon its finances. Notwithstanding the fact that the Southern company by interconnection with the San Joaquin Light & Power Company, the Mount Whitney Power & Electric Company and the Southern Sierras Power Company has used water which during other years had not been used, the war-time increases in production and distribution have accumulated in so much greater proportion that additional revenues are essential."

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Cost of Competing Service—A decision of the Oregon Public Service Commission granting authority to the Oregon Gas & Electric Company to increase gas rates says in part: "From a study of the cost of gas with cost of competing products such as wood, coal and electricity, and considering the relative convenience in the application of these various classes of fuel, we are inclined to the belief that the rates for which application is made are reasonable for the consumer from the standpoint both of the value of the service to be rendered under them and the cost of that service to its producer."

Higher Coal Cost.—Permitting the Public Service Company of Northern Illinois to advance rates regardless of the claim of certain power consumers that, relying on unexpired power contracts, they had entered into contracts for the sale of their manufactured products which would involve heavy loss if the petition of the company should be granted, the Illinois Public Utilities Commission decided several controversial points. It held that comparison of rates between territories served by the petitioning utility and those served by other utilities would be considered for what it is worth as indicative of the general trend of rates for such service. The commission authorized a 15 per cent emergency surcharge on all rates irrespective of existing contracts for service. The decision referred to coal as follows: "In 1914 the cost of fuel represented 50.3 per cent of the production cost of electric energy. In 1915 this percentage had increased to 51.1 per cent; in 1916 to 55.1 per cent, and in 1917 the cost of fuel represented 70.3 per cent of the cost of production. This is particularly significant as applicable to the issues which are raised herein, since electric power business is of the character of a competitive business, which necessarily has been taken upon a narrow margin of profit and in many cases has but slightly exceeded the cost of production. It appears that the amount of increased revenue which will be realized under the rates which are herein proposed will be $129,147 per annum, based upon the amounts of energy consumed under these rates for the year 1917. It further appears that the increased cost of coal consumed for generating the energy sold under this rate for the year 1917 over the cost of a similar amount of coal at the prices prevailing in 1914 is $187,918. It thus appears that the increased revenue derivable from the surcharge will not equal the increased cost of coal."

James C. Legg, Centerville, Md., has been appointed by the Governor a member of the Maryland Public Service Commission, succeeding E. Clay Timanns.

George J. Roberts, formerly first vice-president of the Public Service Corporation of New Jersey, has been appointed head of the new ordnance district department for New York.

B. H. Elliott, formerly superintendent of lines of the Birmingham (Ala.) Railway, Light & Power Company, has been appointed superintendent of power houses and substations of the company.

Major E. M. Watts, formerly connected with the Union Electric Light & Power Company, St. Louis, Mo., and now with the British expeditionary forces at the front, has been promoted to a staff position.

Raymond D. Sherman has resigned his position as electrical superintendent of the Schenectady Power Company, Schaghticoke, N. Y., to become superintendent of the Readsboro (Vt.) plant of the New England Power Company.

E. J. Fowler, formerly statistician of the Commonwealth Edison Company of Chicago, has been commissioned a major. He is at present chief of the information and statistics branch for the office of the Quartermaster General of the United States Army.

James E. Carnes, formerly contract agent and advertising manager of the Nashville (Tenn.) Railway & Light Company, has been appointed to the newly created position of sales and new-business manager. Mr. Carnes entered the employ of the company in 1904.

C. O'B. Murphy, who for the past year and a half has been assistant general manager of the American Public Utilities Company, Grand Rapids, Mich., has been transferred as vice-president and general manager to the Merchants' Public Utilities Company and the Merchants' Heat & Light Company, Indianapolis, which are controlled by the American Public Utilities Company.

Thomas F. Hill, of the railway department of the Southern Pacific Utilities Company in Anderson, N. C., has had his authority extended to cover the meter and contract department, as the result of the resignation of A. E. Holman, who has been superintendent of the latter department for some years. Mr. Hill is one of the oldest men in point of service with the company and its predecessors.

L. L. Newman, assistant general manager of the Birmingham (Ala.) Railway, Light & Power Company, has also been elected vice-president of the company. Mr. Newman was appointed assistant general manager of the company early in 1916, prior to which time he was superintendent of way and structures. Previous to his connection with the Birmingham Light & Power Company he was employed in various departments of the Pennsylvania Railroad.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

F. L. Ball, manager of the Haverhill (Mass.) Electric Company, who at the outbreak of the war was commissioned a Captain in the Reserve Corps, Quartermaster's Department, is at present serving as personnel officer somewhere in France.

I. L. Oppenheimer, president-elect of the Ohio Electric Light Association, has been in the public utility business since 1899. In that year he promoted and organized the Ohio River Electric Railway & Power Company. This company later acquired the Pomeroy Middleport Electric Company. Mr. Oppenheimer has been president and general manager of both companies continuously. In the four years from 1909 to 1913 he was also general manager of street railways in Lexington, Frankfort, Paris, Georgetown and Winchester, Ky., and had charge of interurban lines radiating out of Lexington as well as of the electric lighting system and the City Ice Company at Lexington.

I. L. OPPENHEIMER

A. L. Kenyon has resigned as general manager of the Columbia (S. C.) Railway, Gas & Electric Company and is now engaged in war work for the government, manufacturing ammonium nitrate with the Air Nitrates Corporation at Toledo, Ohio. Mr. Kenyon was formerly engaged as chief engineer of the Empresas Electricas Associadas, Lima, Peru. He returned to the United States in the spring of 1910. The following year he was appointed chief of construction for the Georgia Power Company at Tallulah Falls, Ga. In 1915 he became manager of the Anniston (Ala.) Electric & Gas Company, and in the fall of the following year he took up the work at Columbia from which he has just resigned.

Wallace H. Foster, manager of the Marin (Cal.) district of the Pacific Gas & Electric Company, has left the employ of the company for the period of the war to work with the Food Administration. He has been assigned to the Marine Transportation Department, handling exports, including shipments for relief in Belgium.

G. B. Randall, formerly an employee of the county division of the Union Electric Light & Power Company, St. Louis, Mo., has been recently promoted to the rank of lieutenant-colonel in the Engineer Corps. Lieutenant-Colonel Randall attended the officers' training camp at Fort Leavenworth and is now stationed with the Thirty-seventh United States Engineers at Fort Meyer, Va. At the time of going into the army he was with the Curtis Manufacturing Company.

G. O. House, formerly superintendent of the St. Paul (Minn.) municipal water department, has been appointed manager of the Northern States Power Company at St. Paul, succeeding P. T. Glidden, deceased. Mr. House recently was St. Paul superintendent of the St. Paul Railway Company. Fourteen years ago he organized in St. Paul the Northern Heating & Electric Company, which later became the Consumers' Power Company and finally the Northern States Power Company.

Terrell Croft has been called to Washington by the educational committee of the War Department, of which C. R. Dooley is director, and placed in charge of the work of standardizing the electrical courses of training for enlisted men, and has been granted leave of absence by the Luminous Unit Company of St. Louis, with which he was associated as chief engineer. These courses are now being conducted in various schools and universities throughout the country, and the work of standardizing them is for the purpose of rendering the instruction as effective as possible by adapting it to specific war needs. In a majority of the courses being taught Mr. Croft's books on electricity are now being used as textbooks. Upon graduation from Pratt University in 1903 he became connected with the *American Telephone Journal* as assistant editor. Later he entered the service of the New York & New Jersey Telephone Company as an apprentice and worked his way up to the position of chief draftsman. Subsequently he was given charge of the electrical engineering division of the American Brass Company, Waterbury, Conn. In 1910 he became connected with the Westinghouse Electric & Manufacturing Company and was assigned the work of gathering data and writing special articles for the technical and general press. In that capacity he was transferred to St. Louis, and in 1914 he resigned to engage in practice as a consulting electrical engineer and to complete work for which he had data. Since that time he has taught electrical engineering at Washington University and elsewhere.

TRADE & MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

SALE OF MOTORS IN EAST LOW DURING PAST FEW WEEKS

Manufacturers at a Loss to Assign Reasons—Restriction of Eastern Factory Expansion Possible Cause—Plants Swamped with Orders

With a single exception, manufacturers of motors state there has been a falling off in the booking of new business on the Eastern seaboard. Factories have not caught up with deliveries, the arrearages on shipments extending from two months to two years, according to the type, size and specifications of the individual requirement. Some of the well informed—close observers of passing events—are inclined to believe that the peak has been reached in this section for the increase of electrical motive power.

Now that a slump has occurred, surprise is expressed at the sudden turn. Whether this is temporary or permanent is puzzling the interests most directly concerned. It is recalled that in June the War Industries Board created a barred industrial zone in the East wherein the establishment of additional plants was prohibited.

The restricted area takes in practically the entire Eastern industrial region out as far as Pittsburgh. It is therefore no special cause for wonder that following the formulation of such a ruling the demand for motors should suffer a setback. It is the intention of the government to divert its industrial activities in the production of war material to the West and South. This means a change of markets only, with the manufacturers of motors and electrical accessories receiving their business from those sections. The East has been the predominating factor where the heretofore heavy business has originated. It remains, however, to be seen if this is a correct diagnosis of the situation.

JOBBER EXPLAINS WAR STATUS OF HOUSE TO HIS EMPLOYEES

Men and Women Belonging to Company Are Earnestly Urged to Exceed Record for Exceptional Service So Far Rendered

Faced with the necessity for handling a considerably greater volume of merchandise and details, the electric supply jobber has been particularly hard hit by the rapid turnover of labor. It is doubtful whether many of the employees who have left jobbing houses have realized the essential character of the electrical jobber in the present crisis.

In a special message to employees of the Pettingell-Andrews Company, Boston, Charles B. Price, chairman of the board of directors, is setting forth the part that the man or woman on the staff of a jobbing house can play in rendering "super-service" to the war work of the country and is outlining the importance of doing, not one's "bit," but one's "best," in striving to bring about victory. The stimulating message is contained in an eight-page folder, and it emphasizes the immense importance of furnishing without delay essential materials to the various departments of the army and navy, to the shipbuilding yards, and to the many industrial plants that are running night and day on government work. The booklet was written to help the employees of this company, the largest electrical jobber in New England, to realize that each and every one in the earnest, faithful performance of individual duties is a vital part of the national fighting machine—a soldier of industry.

A good many persons, even in the electrical trade, have not appreciated the extent of war service work which the electrical supply jobber is performing to-day, or the vital need of the jobber's stock as a mainstay of preparedness and active campaigning. The business of the Pettingell-Andrews Company, like that of other jobbers, is now made up almost entirely of war work. The electrical material required by every ship that is put into the water, by every new government building, cantonment, arsenal, naval base, embarkation station and manufacturing plant engaged in war work, is so varied and produced by so many manufacturers in such widely separated sections of the country that only by the exercise of constant vigilance and untiring effort has the jobber been able to keep his warehouses stocked with the material required, thereby succeeding in giving the service that is absolutely necessary in meeting the war conditions. The booklet urges not only giving the government the exceptional service which has been rendered up to this time, but exceeding the records already made.

CONVERSION TO WAR WORK OF LESS ESSENTIAL INDUSTRY

Regional Organizations Present to Business Men New Requirements in the War Program as They Arise

A great many classes of manufacturers are by their very nature in what might be termed a less essential group. Some of these are automatically suffering a decrease in output owing to decreased demand. Others are having their output curtailed because the government will permit them to use only a limited amount of fuel and is making it difficult for them to obtain raw materials.

In either case it will be of particular interest to a number of electrical manufacturing concerns to note that the government has taken steps through regional organizations in the twenty regions into which the country has been divided to permit plants thus slowed down to continue to operate by diverting their machinery to more essential work.

The object of these regional organizations is to furnish the government with the necessary knowledge of national conditions in providing new resources and converting industries to war work. As the various departments of the government develop new requirements in the war program, they are presented to the business men of the country through these regional organizations.

As an indication of what is possible in the conversion of industry to meet war requirements and of the changes which can be made in the product of a factory, a few radical instances may be related. For instance, a Pennsylvania factory that formerly made linoleum is now machining 4.7-in. shells. A Duluth horseshoe manufacturer is turning out trench picks for the army, and a New Jersey terra-cotta tile concern is making dummy drop bombs. A Milwaukee factory, the former output of which was rowboat motors, is making hand grenades and trench pumps. In Rhode Island a manufacturer of finger rings has turned his activities to making adapter plugs. A Detroit stove concern is producing trench bombs and anchor parts. Instances of this sort might be multiplied indefinitely, and they all serve to show the possibilities in converting to war work factories whose normal business has been curtailed by war conditions.

THE WEEK
IN TRADE

FURTHER evidence of mounting prices is reported this week. The increases generally are in small goods and appliances. Demand appears to be keeping up except for industrial equipment in the East and construction material in the Northwest. This latter, however, is undoubtedly merely temporary. The government is rapidly absorbing more and more of the available electrical equipment and manufacturing facilities, so that ordinary commercial business is of necessity dwindling.

Reports continue to indicate an unusual activity in appliance buying. In some measure covering accounts for this at the present time. Conduit continues scarce and the government priority requirements are gradually making themselves felt.

Some particularly seasonable weather during the latter part of last week and during this week has made an impression on fan stocks that the trade was beginning to believe might have to be carried over. Unless this warm spell, however, is of a long duration it seems doubtful if the entire fan stock of the country will be absorbed this season.

Transportation appears to be getting better, particularly on shipments to the Pacific Coast, but there are no indications that it will be cleared up by winter.

Here and there greater efforts in the matter of collections are resulting in the money coming in faster.

NEW YORK

Prices still show a decided upward tendency in various lines. While jobbers are glad to get goods, there is a perceptible holding off in buying on account of the high prices. If jobbers were able to get goods promptly, which is far from being the case, business would be much better. As it is, the volume of sales is very satisfactory. On other than government orders trade is spoken of as conservative. Several concerns that arrange their buying on a basis of three months' requirements and heretofore have not encountered any difficulty in obtaining goods from the manufacturers now say that the situation is getting precarious. The market is far from stable and is consequently causing buyers to hesitate. Beyond placing orders for a certain average quantity of goods, jobbers state, it is a speculative proposition. The unusual risk attendant upon owning merchandise at the top of the market, combined with carrying a large part of the profits from year to year in the increased value of stock, justifies caution.

Collections are receiving more attention than credits, and the results in settlements are better than for several weeks.

MARINE FIXTURES.—The United States Shipping Board Emergency Fleet Corporation of Philadelphia, under date July 16, called for bids for fifty lots of marine fixtures, and fittings of different kinds, in addition to a quantity of plugs, receptacles and other items, are required.

SWITCHES.—A general advance of 15 per cent, effective July 15, is announced on the general line of switches. These include push-button, rotary flush and rotary surface, and snap, remote-control, automatic door, automobile, battery, door-bolt control, feed-through, heater, lock, momentary contact, panelboard and pendent switches.

LIGHTING FIXTURES.—The demand is very light and commercial sales are at a low level. In the past six months there have been about 20 per cent price advances made. Such transactions as are reported cover replacements and maintenance. Some jobbers who have specialized in the fixture line are closing out their stocks on account of there being no market.

ASBESTOS INSULATION.—Price fluctations on tapes, yarns and fiber have been so frequent that fixed prices are impossible. Deliveries are back about two months. Quotations are f.o.b. mill. The recent order of the War Industries Board placing asbestos and magnesia coverings (the latter of which advanced 5 per cent—now list net—on July 13) with commodities for preferential treatment in procuring supplies of fuel and transportation service will also permit the production of a normal supply for the manufacture of electrical specialties.

FLASHLAMPS.—List prices have been advanced on certain types of lamps and batteries. Manufacturers report the demand heavy with a limited supply. In fact, in all sizes and types an increase of 25 per cent was made July 15. This is said to be the first revision on a higher scale in ten years.

FRACTIONAL MOTORS.—All sizes from 0.05-hp. to 0.75-hp. rating are reported as short. One of the large producers, it was learned, had a few of each in stock, of some sizes only from two to six, but it has been unable to accumulate any quanity. The number of orders on hand was said to be tremendous, and therefore catching up was out of the question. Deliveries on any quantity of motors could not be made under ten weeks. A number of large plants working on fractional horsepower motors are running on a twenty-four-hour basis in their motor departments. Eighty per cent of the output of one of these plants are washing-machine motors of 1/6-hp., ⅛-hp. and ¼-hp. ratings. This plant turns out 13,000 washing machine motors monthly. A single order from one washing-machine firm was for 40,000 motors deliverable in a year. Iron and steel are difficult to get for these goods.

WIRE.—All kinds of wire are difficult to obtain except ing on priority orders, which are absorbing 80 per cent of the capacity and material of the drawers and finishers. One jobber who had placed a requisition for wire by mail, and after its acceptance the day before, had the order returned and declined. One of the largest manufacturers recently received governmental specifications for 8000 miles of ten-strand, cotton-insulated copper cable, which cannot be placed in the process of manufacture before Sept. 1. A semi-commercial order for 6,000,000 ft. of two-strand copper wire, rubber-covered, was declined as delivery could not be promised. Deliveries are from four to six months in arrears. A number of important civilian requirements are in the market, but manufacturers cannot accept them.

COLLECTIONS AND CREDITS.—For a month collections have improved on an average of about 5 per cent. They are more carefully watched and looked after and tightened in connection with war conditions than credits, which are by no means neglected. It is aimed to keep bills receivable within limited bounds and accounts liquid. Thirty-day bills are being paid in from forty-five to sixty days. Some renewals are being asked.

CONDUIT.—The supply outside of government requirements is short. Reports that some large stocks are being held locally is questioned.

HEATING APPLIANCES.—The Hotpoint division and the "G. E." division of the Edison Electric Company, Inc., have issued new and higher price lists on their respective lines, effective July 15.

FANS.—With the arrival of warm, seasonable weather this week the demand for fans became emphatic. Producers in this territory have been overrun with orders, and it is certain the available supply will fall far short of the trade's requirements. A survey of the jobbing field was undertaken during the week, and the replies were that jobbers have either a scant stock or none at all. The government has been buying heavily for the equipment of medical and naval bases, transports, cantonments, etc., 90 per cent of which are for direct-current. In New York nearly all the fans are said to be direct-current. These calls have therefore upset the market. A local manufacturer's agency taking 15,000 fans, mostly direct-current, for the season has not yet had the order filled. Dealers and department stores are making special selling campaigns in fans.

CHICAGO

In the Middle West the general business situation remains unchanged. The place to look for orders is still in the factories and mines. Central-station companies are buying little. The extensive financing which is being done in the period between the Liberty loans by industrial plants and food-producing companies in this section makes it seem reasonable to predict that this situation will remain as it is for some time to come. This industrial-plant business is of course indirect war business, but manufacturers in this section are beginning more and more to figure their business in two sections, namely, that percentage which is direct war business and that which is indirect war business.

In general, it may be said that all plants are having some difficulty owing to the scarcity of raw material. Occasionally, however, a factory is discovered which has on hand in its warehouses material enough to last it for some time.

There is some activity in the Central West which is attributable to housing employees of plants on government work. One order for $50,000 worth of wire and cable was placed this week by the Ford company of Detroit.

LAMP CORD.—Prices have been increased from 33 cents to 34 cents by Chicago jobbers.

TRANSFORMERS.— Local agents of transformer companies report a considerable volume of business done already for the month of July and that a really enormous amount of business is hanging fire.

FANS.—No fan weather has yet arrived in Chicago. It has not been necessary as yet for the Chicago jobbers to ship into other territories which report good fan sales.

WASHING MACHINES.—The Western Electric Company has increased the price of its washing machines 10 per cent. The prices of other manufacturers had already been advanced.

HEATING DEVICES.—The prices of certain lines of heating devices have been increased this week. Five-dollar flatirons have gone to $6, six-dollar irons have gone to $7.

BATTERIES AND FLASHLAMPS.—"Ever - ready" products have taken a rather marked advance. This is the first time in the memory of some rather experienced electrical people that "Ever-ready" products have been increased in price.

BOSTON

An extremely heavy volume of trade is noted this week in New England. Government work predominates as usual. Stocks vary widely among different jobbers. On the whole, bins are well filled, but in certain lines an increasing scarcity is apparent. Little conduit, for example, enters New England to-day unless scheduled for some form of war work. Occasional shipments ordered many months ago filter in through the freight embargoes. Railroads are swamped with traffic, and no improvement in deliveries is anticipated this year, so far as rail conditions go. This factor tends to increase the size of the jobber's stock beyond normal.

With the exception of the advance of copper to a 34-cent base and an upward movement in conduit, prices of the heavier materials are about the same as when July came in. Effective July 15, an upward price revision was made by the "G. E." division of the Edison Electric Appliance Company, Inc., applying to flatirons, toasters, ranges and other heaters, and averaging about 12 per cent increase. Porcelain advanced 20 to 25 per cent on July 18.

The labor situation is greatly disturbed in New England this week. A serious strike is on at the Lynn (Mass.) plants of the General Electric Company, involving probably at least 12,000 workers and tying up important government production. The principal point at issue appears to be the open-shop question. Other strikes are in progress at Springfield, Mass., and in other munitions centers. Jobbers have been hard hit by the draft, but the "work or fight" order has had little effect upon this branch of the industry. Collections are good for this time of year except in the case of the small contractor.

PORCELAIN.—Stocks are in fairly good shape at present, but are likely to be considerably reduced in the near future by the inability of manufacturers to procure material. The shipyards are buying heavily. Prices increased about 25 per cent maximum the latter part of last week. There is some danger that the jobbers will be caught with low porcelain stocks.

CONDUIT.—Pipe cannot now be successfully ordered for non-essential uses, and deliveries are conditioned upon the materials being used in war work. A two-point advance in price plus 25 per cent for freight has just gone into effect. Stocks are far from satisfactory, generally speaking.

LAMPS.—Little change can be seen in the lamp situation this week. Stocks are in much better shape at this time than a year ago. Warehouses are well prepared to take care of the fall demand, and millions of lamps are now being held in reserve stock, packed and ready for shipment from the factories. The General Electric Company is building an addition to its East Boston lamp factory which will bring the production up to about 120,000 lamps per day when the installation is completed. The government continues to absorb large quantities of lamps of all types in 25, 40, 50 and 60-watt units for use in various buildings in the 100 or more shipyards now working night and day in this country. Miniature lamps are being produced on an immense scale for use in submarines, chasers and the navy in general.

INDUSTRIAL ELECTRIC TRUCKS.—The demand is increasing so fast that dealers are chiefly occupied in attending to inquiries and sales, relatively less energy being put at this time upon exploitation work. Shipment conditions are showing some improvement.

FANS.—Fans are now selling briskly in response to the influx of warm and humid weather, but it looks as though a good many equipments would be carried over.

FLATIRONS.—Manufacturers are far behind on orders, with more to come.

ATLANTA

Business in all lines appears to be well sustained throughout the entire Southeastern section. An appreciable lull in staple lines is noted for Atlanta this week. The slowing up in trade at this point is attributed to the street-railway strike, which is quite a disturbing factor.

The Southeast is again experiencing a protracted drought, which bids fair to be worse than the continued dry spell late in 1917. Already one power company is arranging to cut off secondary power customers, with the possibility of the general power users being affected soon afterward.

The increasing government embargoes on materials used in so-called non-essential buildings has a tendency further to curtail activities in general contracting work. A number of industrial developments have been announced this week, the most important being in connection with government war activities. The Sloss-Sheffield Steel & Iron Company of Birmingham, Ala., is contemplating making an investment of $2,000,000 to build by-product ovens for the manufacture of coke products for war purposes. Chemicals will also be manufactured by the Plough Chemical Company of Memphis, Tenn.

LAMP CORD.—Shipments are coming in better and in ample lots to take care of a slightly decreasing demand.

FANS.—The week has registered temperatures below normal, and the movement of practically all sizes has slowed away down. While a fan shortage existed during the rush weeks jobbers now feel that stocks are sufficient.

CHARGING OUTFITS.—There seems to be an ever-increasing demand for these outfits, and arriving shipments go literally like "hot cakes." Shipments have been good, but they are slowing up a little now.

WIRE.—Jobbers report a steady volume of sales, with no apparent cessation in sight.

LAMPS.—While there is a free movement of lamps of all sizes, the season has not advanced sufficiently to record any material change in the demand of the past few months.

The 60-watt size appears to be the most popular. In general stocks are accumulating and well distributed geographically throughout the Southeast.

SEATTLE

War service plants, especially shipyards and allied industrials, did the major portion of the buying the past week. Specialty sales were featured by a heavy movement of domestic appliances, particularly washing machines. Shipyards are not buying as heavily as heretofore, but as sale volumes fluctuate dealers manifest little concern from week to week. Naturally the heaviest sales are made when ship contracts are awarded. Sales following the initial order consist mainly of pick-ups and extras. Sales in the past week at Bremerton and the cantonments were light. Little buying from the Puget Sound Navy Yard has come to light for the past two weeks, although an order of considerable proportions, particularly for wire, wiring devices, fixtures, etc., to care for the ambitious residence building program starting by the government at the navy yard, in addition to the government shops and industrial buildings, will boost electrical sales. Commercial sales by jobbers to retailers are holding up well. Retailers report an active movement of stocks and counter sales increasing.

Alaska sales are down to a minimum. In fact, this condition has prevailed for the past month. However, considerable equipment for maintenance and small extensions to canneries and mills in southeastern Alaska is going forward.

Stocks show no improvement. They are in a disorganized state owing to heavy demands that Eastern shipments on order have not replaced and to government regulations regarding use of steel, in addition to freight conditions. The larger jobbers are ordering for months ahead in an effort to keep up with demands. Collections are very good, with a slight improvement showing over the past few weeks.

Northwest shipbuilders in Seattle, Tacoma and Portland during the week secured contracts for additional wooden and steel vessels. Recommendations amounting in effect to contracts to seven shipyards in the Portland territory include fourteen steel steamers and sixteen wooden vessels.

The government will not spend money in Seattle to solve the city's housing problem, but expects the city to provide homes for the industrial army. The Housing Bureau, Seattle Branch, is receiving bids for 250 houses, a 400-room concrete hotel and two concrete apartment houses. The Standifer Construction Corporation, Vancouver, Wash., plans immediate erection of a 300-room hotel, 100 cottages and bungalows.

POWER APPARATUS.—Sales for maintenance and extensions show an increase. Big sales are pending for new yards and industrials. Shipments are about keeping pace with demand.

CONDUIT.—Demand exceeds supply. Substitution in size and colors is being practiced generally. Shipments are coming through poorly.

SAN FRANCISCO

The vacations of all the soliciting salesmen of San Francisco electrical jobbers were held simultaneously this year during the first two weeks of July. Business is now approaching normal.

Railroad freight service from Eastern factories has improved, time of transit for carloads now being from three to four weeks, which is an improvement of 50 per cent.

A power administrator for the power situation in the northern section of California has been appointed by the California State Railroad Commission.

The total number of building permits for Los Angeles for the month of July was 509, and their value $778,000. During the same month the building permits of San Francisco totaled 363, with a value of $1,116,000.

Sales of electric railway material are poor, comparatively no new construction work being carried on or in sight. The Pacific Electric Railway Company, operating an extensive system of lines in southern California, will extend its lines to Yucaipa and Redlands as soon as it is possible, although the latter extension will probably have to be postponed until after the war. The city of San Francisco has awarded a forty-thousand-dollar contract to the General Electric Company for furnishing electric locomotives to the Hetch Hetchy water property site.

Plans for the installation of ornamental electric lighting systems for the cities of Orange, Santa Barbara and San Carlos, Cal., are under consideration.

WIRE.—F.o.b. Pacific Coast prices on rubber-covered wire and certain styles of telephone wire have increased about 7½ per cent. The demand still continues at flood-tide for rubber-covered wire, with the possibility of an increase in the near future, especially on the circular-mill sizes, which will undoubtedly be required for the considerable extensions to shipbuilding plants already ordered.

APPLIANCES.—Prices on small heating devices have considerably increased, and protecting business has resulted in a great flood of orders.

ELECTRIC RANGES.—There has been no great increase in sales of electric ranges, although the numbers of inquiries predict future results, especially when the power companies are better able to take care of the increased loads.

METAL MARKET SITUATION

War Industries Board Declines to Adjust the Contracts of Commercial Copper Consumers

Advices from Washington state that the War Industries Board has declined to interfere in the settlement of contracts between producers and commercial consumers of copper, or to make any ruling on the price dispute. The commercial consumers are reported as sustaining a heavy loss in consequence of their looking in good faith for orders for their commodities based on the 23.50-cent price.

Manufacturers of finished electrical products in either copper, brass or bronze are disinclined to quote prices, excepting such as prevail at the time of shipment f.o.b. factory. They state that no free copper is available to be delivered by Aug. 15, when the 26-cent rate may be possibly increased. Deliveries are now three and four weeks behind. Even if the current price had been fixed until Jan. 1 next a more active and stabler situation would exist, according to the opinion of many interested. The short supply of platinum is engaging the serious consideration of the government, as its use in certain electrical instruments and other needful war material is indispensable. The visible stock is so curtailed and its demand in essential industries so great that it may become necessary to commandeer the metal in whatever condition it may be found. Tin and lead are firm and in no plentiful supply for anything but government work.

NEW YORK METAL MARKET PRICES

	July 15	July 22
Copper:	£ s d	£ s d
London, standard spot	110 0 0	110 0 0
	Cents per Pound	Cents per Pound
Prime Lake	Govt. price 26.00	Govt. price 26.00
Electrolytic	Govt. price 26.00	Govt. price 26.00
Casting	Govt. price 26.00	Govt. price 26.00
Wire base	29.75	29.75
Lead, trust price	8.05	8.05
Antimony	13.12½ to 13.25	13.12½ to 13.37½
Nickel, ingot	40.00	40.00
Sheet zinc, f.o.b. smelter	Govt. price 15.00	Govt. price 15.00
Spelter, spot	8.80 to 8.90	8.65 to 8.75
Tin, Chinese*	$1.00	$1.00
Aluminum, 98 to 99 per cent	Govt. price †33.00	Govt. price †33.00

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	23.50 to 24.00	23.50 to 24.00
Brass, heavy	14.00 to 14.50	14.50 to 15.00
Brass, light	12.00 to 12.25	12.00 to 12.25
Lead, heavy	7.12½ to 7.50	7.12½ to 7.50
Zinc, old scrap	6.50 to 6.75	6.50 to 6.75

* No Straits offering. † In 50-ton lots or more; carload, 33.10 cents per lb., 1-ton to 14-ton lots, 33.20 cents per lb.

Current Prices of Electrical Supplies

New York and Chicago Quotations

THE prices quoted are those prevailing in standard packages of specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers. Price variations may be due to difference in grade of products of different manufacturers, to local conditions, or to both.

ARMORED CONDUCTOR, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List Per 1000 ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

Single-Conductor

No. 14 Solid	
Less than coil	List
Coil to 1000 ft	12½%
No. 12 Solid	
Less than coil	List
Coil to 1000 ft	12½%

Twin-Conductor.

No. 14 Solid	
Less than coil	List
Coil to 1000 ft	12½%
No. 12 Solid	
Less than coil	List
Coil to 1000 ft	12½%

DISCOUNT—CHICAGO

Single-Conductor

No. 14 Solid	
Less than coil	+20%
Coil to 1000 ft	5%
No. 12 Solid	
Less than coil	+20%
Coil to 1000 ft	5%

Twin-Conductor

No. 14 Solid	
Less than coil	$115.00
Coil to 1000 ft	80.00
No. 12 Solid	
Less than coil	+20%
Coil to 1000 ft	5%

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	$24.00
1/5 to std. pkg	19.80
Std. pkg	18.75

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+20% to 12%
1/5 to std. pkg	List to 20%
Std. pkg	25% to 44%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 50	.36	.36
50 to barrel	.32	.33
Barrel lots	.289	.299

BATTERIES, DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 50	.35	.35
50 to barrel	.3220	.3320
Barrel lots	.2920	.3020

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. per Coil	List per 100 Ft.
⅜	250	$5.00
½	250	7.50
⅝	100	10.00
¾	50	13.00
1	50	21.00
1¼	50	26.00
1½	25–50	35.00
2	25–50	45.00
2½	25–50	52.00

NET PER 1000 FT.—NEW YORK

	Less Than Coil	Coil to 1000 Ft.
⅜-in. single strip	$82.50	$75.00
⅜-in. double strip	82.50	75.00
½-in. single strip	110.00	100.00
½-in. double strip	110.00	100.00

NET PER 1000 FT.—CHICAGO

	Less Than Coil	Coil to 1000 Ft.
⅜-in. single strip	$75.00	$63.75 to $64.25
⅜-in. double strip	78.75	71.25
½-in. single strip	100.00	85.00
½-in. double strip	105.00	93.00 to 95.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List per Foot	Size, In.	List per Foot
⅜	$0.05½	1	$0.25
½	.06	1¼	.33
¾	.09	1½	.40
⅞	.12	1¾	.47
1	.15	2	.55
1¼	.18	2½	.65

NET PER 1000 FT.—NEW YORK

	Less Than $15 List	$15 to $60 List	$60 to $150 List
⅜-in.—	$25.00	$24.00	$23.00
½-in.—	30.00	28.00	26.00

NET PER 1000 FT.—CHICAGO

	Less Than $15 List	$15 to $60 List	$60 to $150 List
⅜-in.—	$60.00	$30.00	$26.50
½-in.—	$65.00	$32.50	$29.00

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 40

Size, In.	Conduit, List per Foot
¼	$0.08½
⅜	.08½
½	.08½
¾	.11½
1	.17
1¼	.23
1½	.27½
2	.37½
2½	.58½
3	.76½

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON—Continued

Size, In.	Couplings, List	Elbows, List
¼	$0.05	$0.19
⅜	.06	.19
½	.07	.19
¾	.10	.25
1	.13	.37
1¼	.17	.45
1½	.21	.50
2	.28	1.10
2½	.40	1.80
3	.60	4.80

DISCOUNT—NEW YORK

	¼ in. to ½ in.	¾ in. to 3 in.
Less than 2500 lb	12%	14%
2500 to 5000 lb	15%	17%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	¼ to ½ In.	¾ to 3 In.
Less than 2500 lb	+5%	+3%
2500 to 5000 lb	+2%	List

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$6.00
Discount	30%

CHICAGO

List price	$5.50
Discount	25%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp.	100	$0.25
35-amp. to 60-amp.	100	.35
65-amp. to 100-amp.	50	.90
110-amp. to 200-amp.	25	2.00
225-amp. to 400-amp.	25	3.60
450-amp. to 600-amp.	10	5.50
600-Volt		
3-amp. to 30-amp.	100	$0.40
35-amp. to 60-amp.	100	.60
65-amp. to 100-amp.	50	1.50
110-amp. to 200-amp.	25	2.50
225-amp. to 400-amp.	25	5.50
450-amp. to 600-amp.	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	30%
1/5 to std. pkg	41%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	30%
1/5 to std. pkg	40%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg	$5.50
1/5 to std. pkg	4.75

Standard packages, 500. List, each $0.07

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg	$7.00
1/5 to std. pkg	5.75

Standard packages, 500. List, each, $0.07

LAMPS, MAZDA

105 to 125 Volts

Regular, Clear:	Std. Pkg.	List, Each
10 to 40-watt—B	100	$0.30
60-watt—B	100	.35
100-watt—B	24	.70
75-watt—C	50	.70
100-watt—C	24	1.10
200-watt—C	24	2.20
300-watt—C	24	3.25
Round Bulbs, 3½-in., Frosted:		
15-watt—G 25	50	.53
25-watt—G 25	50	.55
40-watt—G 25	50	.55
Round Bulbs, 3¾-in., Frosted:		
60-watt—G 30	24	.77
Round Bulbs, 4½-in., Frosted:		
100-watt—G 35	24	1.10

DISCOUNT—NEW YORK

Less than std. pkg.	List
Std. pkg.	10%

DISCOUNT—CHICAGO

Less than std. pkg.	List
Std. pkg.	10%

LAMP CORD

Cotton Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$30.20
Coil to 1000 ft.	27.18

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$35.00
Coil to 1000 ft.	26.00

LAMP GUARDS, WIRE

Standard packages from 50 to 150

NEW YORK

Net per 100	$24.00

CHICAGO

Net per 100	$30.00

OUTLET BOXES

Nos.	List, Per 100
101—A, A1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200, S.E., 300, A.X., 1½, 4 S.	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S., 1½, 3 R	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	33%	27%
$10.00 to $50.00 list	42%	37%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	40%	35%
$10.00 to $50.00 list	50%	45%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

PORCELAIN CLEATS—UNGLAZED

Two and Three Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg.	$15.80
1/5 to std. pkg.	14.80

Standard package, 2200. List per 1000, $20.

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg.	$15.80
1/5 to std. pkg.	14.80

Standard package, 2200. List per 1000, $20.00

PORCELAIN KNOBS

NEW YORK

Per 1000 Net	Std. Pkg. 3500 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg.	$11.85	$30.75
1/5 to std. pkg.	11.10	24.00

CHICAGO

Per 1000 Net.	Std. Pkg. 3500 5½ N.C.—Solid Nail-it—	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg.	$11.85	$30.75
1/5 to std. pkg.	11.10	24.20

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
⅛-in. cap key and push sockets	500	$0.33
⅛-in. cap keyless socket	500	.30
⅛-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+10%
1/5 to std. pkg.	5%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	10%
1/5 std. pkg.	16⅔%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. P. S. T.	$0.80
60-amp. S. P. S. T.	1.20
100-amp. S. P. S. T.	2.25
200-amp. S. P. S. T.	3.48
300-amp. S. P. S. T.	5.34
30-amp. D. P. S. T.	1.20
60-amp. D. P. S. T.	1.78
100-amp. D. P. S. T.	3.38
200-amp. D. P. S. T.	5.20
300-amp. D. P. S. T.	8.00
30-amp. 3 P. S. T.	1.80
60-amp. 3 P. S. T.	2.68
100 amp. 3 P. S. T.	5.08
200-amp. 3 P. S. T.	7.80
300-amp. 3 P. S. T.	12.00
Low Grade:	
30-amp. S. P. S. T.	0.42
60-amp. S. P. S. T.	.74
100-amp. S. P. S. T.	1.50
200-amp. S. P. S. T.	2.70
30-amp. D. P. S. T.	.68
60-amp. D. P. S. T.	1.22
100-amp. D. P. S. T.	2.50
200-amp. D. P. S. T.	4.50
30-amp. 3 P. S. T.	1.02
60-amp. 3 P. S. T.	1.84
100-amp. 3 P. S. T.	3.76
200-amp. 3 P. S. T.	6.76

DISCOUNT—NEW YORK

	High Grade
Less than $10 list	List
$10 to $25 list	15%
$25 to $50 list	20%
	Low Grade
Less than $10 list	10%
$10 to $25 list	25%
$15 to $50 list	28%

DISCOUNT—CHICAGO

	High Grade
Less than $10 list	+15%
$10 to $25 list	List
$25 to $50 list	5%
	Low Grade
Less than $10 list	+5%
$10 to $25 list	8%
$25 to $50 list	16%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single pole	250	$0.28
5-amp. single-pole, ind.	250	.32
10-amp. single-pole	100	.48
10-amp. single pole, ind.	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P.	100	.66

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

SWITCHES, SNAP AND FLUSH—Continued

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+10%
1/5 to std. pkg.	5%
Std. pkg.	23%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	+10%
1/5 to std. pkg.	16⅔%
Std. pkg.	25%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar—	List Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	List	List
$2.00 to $10.00 list	10%	5%
$10.00 to $50.00 list	20%	10%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $2.00 list	25%	15%
$2.00 to $10.00 list	25%	15%
$10.00 to $50.00 list	35%	25%

TOASTERS, UPRIGHT

NEW YORK

List price	$6.00
Discount	30%

CHICAGO

List price	$6.00
Discount	25%

WIRE ANNUNCIATOR

NEW YORK

	Per Lb. Net
No. 18, less than full spools	$0.4625
No. 18, full spools	.4425

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.69
No. 18, full spools	.575

WIRE, RUBBER-COVERED, N. C.

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net — Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
No.			
14	$15.00	$12.00	$10.50
12	23.22	21.20	17.42
10	29.70	27.00	24.80
8	41.91	38.10	32.58
6	60.30	54.27	51.56

CHICAGO

	Price per 1000 Ft. Net — Less than 500 Ft.	500 to 2500 Ft.	2500 to 5000 Ft.
No.			
14	$	$21.00	$	$16.00	$	$13.25
12	27.53– 28.70	23.86– 28.70	22.02– 24.50
10	33.02– 40.10	30.48– 40.10	27.44– 34.23
8	46.09– 56.50	42.54– 48.23	38.99– 41.34
6	61.30– 91.18	61.76– 77.84	52.18– 66.72

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 to 3 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb.	$37.75
25 to 50 lb.	37.75
50 to 100 lb.	36.75

CHICAGO

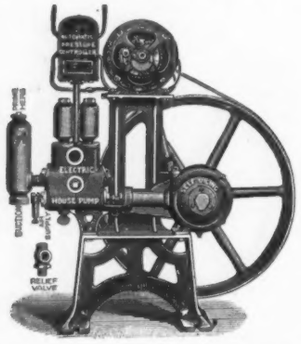
	Per 100 Lb. Net
Less than 25 lb.	$39.50
25 to 50 lb.	38.50
50 to 100 lb.	37.50

NEW APPARATUS & APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Inclosed "Bulldozer" Electric Power Pump

For general service on farms, plantations, country estates, hotels, etc., or wherever from 500 gal. to 3000 gal. (1892 l. to 11,356 l.) of water per hour is required against 100 lb. pressure (7 kg. per sq. cm.) or 225 ft. (68.5 m.)



PUMP DRIVEN BY MOTOR THROUGH BELT

elevation, F. E. Myers & Brother, Ashland, Ohio, have placed upon the market a self-oiling fully inclosed "bulldozer" power pump. The power end consists of a one-piece casting which forms the base of the pump. The pump is driven by a motor belted to the large pulley wheel of the pump.

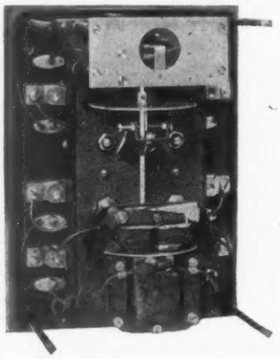
Polyphase Induction Reverse Power Relays

The polyphase induction reverse power relay manufactured by the General Electric Company, Schenectady, N. Y., will operate correctly on practically all single-phase short circuits, even though the voltage between two lines which are short-circuited may fall to zero, on balanced three-phase short circuits giving 10 amp. in the secondary and 1 per cent of normal voltage, and in practically every case for balanced short circuits with a voltage of 0.5 per cent normal. When the voltage falls to such a low value as 0.5 per cent normal, however, system conditions are apt to be so distorted that positive operation cannot be assured in every case with any relay.

The relay is constructed along the lines of a polyphase watt-hour meter, but with three instead of two driving elements. Each of the elements has a current and a potential coil. Two disks connected to a single operating shaft are used, the upper one of which is driven by one element and the lower by two elements, one in front and one in back.

The use of three elements is required for grounded Y circuits and is a distinct advantage even when the relay is used on ungrounded circuits. If only two elements were used, many single-phase troubles would involve one of the elements and the benefit of polyphase action would be lost. Although only one element may be involved in case of a ground on a grounded Y circuit, the voltage triangle will not become so badly distorted as when a single-phase line-to-line short exists. For underground circuits two current and two potential transformers are sufficient. The third current coil carries the resultant current of the two current transformers, and the third potential coil is connected across the open delta of the two potential transformers.

The manufacturers state that the polyphase construction makes the action of the relays more reliable than three



REVERSE POWER RELAY OPERATING ON WATT-HOUR-METER PRINCIPLE

single-phase relays because any incorrect tendency on the part of one phase is balanced by a similar but opposite tendency on some other phase. The incorrect tendencies offsetting each other, the true power direction will control the operation.

The single-throw or double-throw contacts which are provided for controlling the tripping current of the automatic circuit-opening device carry current for only an instant, because the closing of these main contacts sends the entire tripping current of the breaker being protected through the operating coil of an auxiliary relay, causing its contacts to close and short-circuit the main relay contacts. The auxiliary contacts are sealed closed by the tripping current until the trip circuit has been opened by means of an auxiliary switch on the air or oil circuit breaker. The breaking of the tripping current by this auxiliary switch permits the auxiliary relay to open.

Vibration is practically eliminated even at very heavy currents. The relays are made sensitive in order to operate properly on very low potentials. Thus overload relays must be used in conjunction with the reverse power relays to prevent operation at normal potential until a predetermined current and time are reached. The contacts of the overload and reverse power relays are connected in series so that both must close to trip the breaker. Any type of overload relay can be used, but the plunger type is recommended when instantaneous action is desired. The time and current settings of the overload relay determine the action of the combination.

Fuse and Circuit Tester

For testing fuses while in circuit the Electric Service Auto Company, 391 Oak Street, Portland, Ore., is marketing the Universal fuse and circuit tester for 110 volts to 600 volts. This device can be used for testing all alternating-current or direct-current circuits in these ranges and can also be used for locating open or short circuits, grounds or any other trouble occurring in lighting or power lines or apparatus. It is designed to eliminate the cumbersome and costly "lamp bank" and replace it with an economical, safe and serviceable device that at all times can be carried in the pocket. The manu-

"AMATEUR-PROOF" FUSE AND CIRCUIT TESTER

facturers claim that this tester is "amateur-proof." It is always set for testing 600 volts.

The device consists of a case of

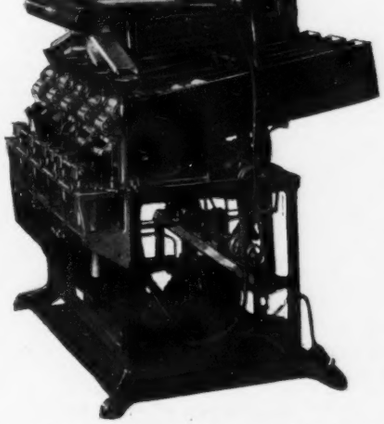
molded insulation 3 in. long by 2 in. wide by 1 in. deep (7.6 cm. by 5.1 cm. by 2.5 cm.), with no current-carrying parts exposed. In this case there is a test bulb of 110-volt potential, a coil of resistance wire and push-button contacts. The push-button is operated from the outside and is so arranged that all of the resistance is ordinarily in circuit with the lamp bulb. This allows the tester to be used in voltages up to 600 volts in this position. When voltages are tested under 400 volts the push-button is pressed so that half the resistance of the coil is short-circuited. The manufacturers claim that if the push-button is accidentally pressed on high voltages, no damage will be done.

Self-Starting Farm-Lighting Plant

The Unilectric Corporation, 235 Mount Elliott Avenue, Detroit, Mich., is manufacturing a 660-watt farm-lighting unit complete with battery and self-starter. Motors totaling ½ hp. rating can be operated, and at the same time 300 watts can be used for illumination with this set. Constant voltage is maintained at all times under varying loads by an electric throttle governor. The plant is started and stopped by a push button.

Automatic Coin-Handling Machine

Considerable labor is saved at the offices of the Detroit United Railways Company by automatic coin-handling machines that have been developed by the Sattley Coin Handling Machine Company of Detroit, Mich. These machines, operated by Westinghouse ⅓-hp. motors, are said to handle an



MACHINE AUTOMATICALLY TAKES COINS, SORTS AND COUNTS THEM

average of 200,000 coins each day. The coins are merely dropped into the hoppers at the top, and the battered and worn pieces are thrown out and the remaining coins are sorted into their respective denominations. They are accurately counted and properly wrapped in rolls of any desired amount.

Mill-Type Electric Lifting Magnet

Grounds, open ends and short circuits due to the loosening of internal screw and nut connections caused by the vibration and jolts to which electric lifting magnets are usually subjected are said to be eliminated in a mill-type magnet that is being manufactured by the Ohio Electric & Controller Company, 5900 Maurice Avenue, Cleveland, Ohio. This is accomplished, the manufacturers claim, by the use of welded connections and of all-asbestos insulations. Another serious trouble elimi-

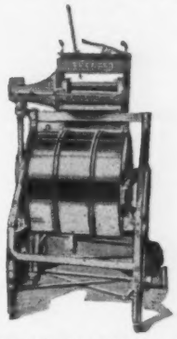
MAGNET LIFTING MISCELLANEOUS SCRAP AND 9-IN SHELL

nated is the breakage and loosening of bolts, which leads to the disrupting of outer rings. This result is achieved by using a ring 8 in. (20.3 cm.) or greater in height and secured by heavy chrome-vanadium steel studs. Other features of this magnet are the minimum head room needed, the ample amount of copper in the coil, heat-radiating ribs and flexible armored leads anchored in the case and welded directly to the coil.

Copper-Tub Washing Machine

That dirt is removed from a fabric wholly by water agitation and without friction or abrasion is the main feature of a washing machine that is being distributed by Wallace B. Hart, 46 East Forty-first Street, New York City. This machine, which is known as the "1900" Cataract electric washer and wringer, consists of a solid copper tub tin-planished on the inside. It operates on the oscillating principle; that is, the copper tube swings back and forth at the rate of forty strokes in each direction per minute and is so constructed that there is a perfect figure eight movement of water, suds and clothes when the tub is in motion.

There is no cylinder or operating part within the tub—nothing to take out and clean after each washing. The manufacturers claim that washing can be accomplished by this machine with minimum time and effort on part of the operator and with the least amount

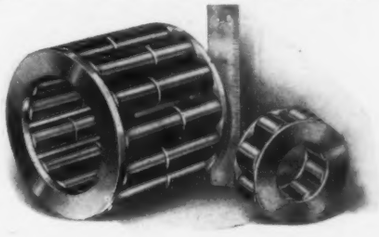


ATTACHMENT ON MACHINE AUTOMATICALLY TAKES CARE OF OVERLOAD

of wear and tear on the clothes. When in use the washing machine is placed directly in front of the right-hand tub of a pair of stationary tubs. The movable wringer is used for wringing the clothes from the tub of the washing machine into the stationary tub directly back of the washing machine. It may then be moved to a position between the two stationary tubs and used for wringing the clothes from one of these tubs to the other. Thus the washer and wringer may be used simultaneously. The facilities provided make it possible for the operator to wash, rinse, blue, wring and make ready for the line in twelve minutes a batch of clothes consisting of twelve full bedsheets or the equivalent. This machine is also equipped with a mechanical attachment for automatically taking care of overload on the tub and the wringer. This attachment eliminates breakage or damage from misuse or abuse of the machine.

Light-Duty Roller Bearing

The Railway Roller Bearing Company of Syracuse, N. Y., has placed upon the market the "Rollway" light-



BEARING FOR USE IN MOTORS OF COMPARATIVELY LIGHT SIZES

duty bearing. The rollers of this bearing are spaced by ⅛-in. (0.5-cm.) cold-rolled pins. These are shouldered and power-riveted to the side plates which assures a smooth surface that will not hinder the bearing from floating should one end bear slightly on the housing. Larger bearing rollers are made in two sections in order to reduce the friction should one end of a roller wear smaller than the other.

Trade Notes

Government Contracts

The departments at Washington, D. C., since July 10 to July 17, have made purchases and awarded contracts as follows:

ARMY MEDICAL DEPARTMENT—Victor Electric Company, X-ray equipment; Waite & Bartlett Manufacturing Company, X-ray equipment; Campbell Electric Light Company, X-ray apparatus.

ARMY QUARTERMASTER DEPARTMENT—John A. Roebling's Sons' Company, coils; Westinghouse Electric & Manufacturing Company, electric flatirons; Bailey Electric Supply Company, motors; Peerless Light Company, bulbs; Beacon Electric Works of National Carbon Company, flashlamps.

GENERAL ENGINEER DEPOT OF THE WAR DEPARTMENT—Star Electric Motor Company, spares for lathes, shaper and drill presses; Westinghouse Electric & Manufacturing Company, pinions; Cutler Hammer Manufacturing Company, spare parts for compressors and cupola blowers; Winton Company, gasoline-electric generating sets; Robbins & Myers Company, spares for cupola blowers; Simplex Wire & Cable Company, electric wire and cable; Western Electric Company, copper wire bars; Imperial Electric Company, spares for commutating pole for compressors; General Electric Company, transil oil.

NAVY DEPARTMENT, BUREAU OF SUPPLIES AND ACCOUNTS—General Electric Company, ventilating sets, searchlamps, spare globes, electric motors, switches, planer equipment; Westinghouse Electric & Manufacturing Company, fans; Edison Electric Appliance Company, bake ovens; American Electric Company, telephone type sets; Ideal Electric Manufacturing Company, motors; Sprague Electric Works of the General Electric Company, switchboxes; Western Electric Company, switchboards; James Clark, Jr., Electric Company, drills; Carlisle & Finch Company, searchlamps; Case Crane & Engineering Company, electric traveling crane; Electric Tachometer Corporation, transmitters; Russell & Stoll Company, lighting fixtures; Lincoln Electric Company, motors; National Electric Supply Company, mica; United States Electrical Tool Company, grinders; Electric Specialty Company, dynamotors; Hobart Brothers, generators.

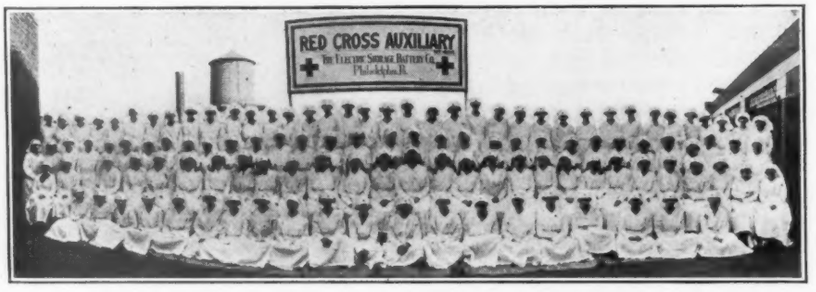
DAY NURSERY FOR BALL-BEARING PLANT.—The New Departure Manufacturing Company, of Bristol, Conn., has lately established a day nursery for the children of its women employees. This commendable expression of welfare work on the part of the company is really a new departure. Furniture, fittings and the general game equipment is in diminutive form to accommodate the little folk. In addition, a large playground for the children has been partitioned off on the north side of the engineering building. Here play apparatus will be installed and sand piles provided, so that much of the day can be spent out of doors in good weather. Competent and experienced attendants are a part of the installation.

SPAIN AS A TURBINE MARKET.—Relative to the introduction of turbines in Spain the *Electrical Review* of London, Eng., says: "Circumstances are forcing Spain along the path of progress. There is, however, a serious obstacle in the way, i.e., the construction of large water turbines and electric generators. Hitherto these have been imported, but outside sources are not now available. One of the largest American makers of turbines recently wrote: 'While there is a great need for water-power development in Spain as well as other countries, very little is being done just now, and until conditions change we do not look for an improvement.' The same is true of British makers, and it is a matter for regret that they cannot seize the present opportunity. It is doubtful if Spain, unassisted, can manufacture all the necessary heavy machinery either this year or during the next five years, but assuredly she will try to do so. And after the war, as before, Germany will again be supreme in the Spanish field, while England will lose the greater part of the trade in coal, without any compensating increase in the supply of manufactured goods."

RELATION OF WAR AND TRADE.—The Irving National Bank of New York has published in pamphlet form "Trade and the War," by G. A. O'Reilly, its foreign trade representative, an address delivered before the Cleveland (Ohio) Advertising Club. "The War and Its Effect on World Trade" is published by the National City Bank of New York City and is an address given before the twenty-fifth annual convention of the Virginia Bankers' Association at Old Point Comfort, Va., on June 20, by Stephen H. Voorhees, vice-president of the bank. Copies of both publications may be had free on application.

BONDS FOR SHIPPING CHARGES.—The United States Railroad Administration, division of public service and accounting, on July 11 issued circular No. 16, which deals with the matter of bonds to be required in connection with the extension of credit for transportation charges, as prescribed in general order No. 25, effective Aug. 1. The bonds covering the extension of credit will be of two classes, namely, (1) to cover patrons transacting business at one or more points with one carrier; (2) to cover transactions at one point with two or more carriers. Details applicable to both classes of bonds are furnished.

RED CROSS WORK OF STORAGE BATTERY GIRLS.—Every Monday night 170 girls, members of the Red Cross Auxiliary No. 404, of the Electric Storage Battery Company, Philadelphia, meet in a room devoted to the purpose, where surgical dressings are made under the supervision of Mrs. Ada S. Bull, chairman of the auxiliary and also matron of the Electric Storage Battery Company. All necessary equipment and material are furnished by the company, and the girls volunteer their services, doing the work after business hours. Several of them have completed courses at the Red Cross headquarters, receiving special instructions for the purpose of teaching others. Enthusiasm and adaptability have enabled all to make rapid progress, and many girls who have not already joined the auxiliary are planning to do so.



AMERICAN ELECTRICAL GOODS REPLACE GERMAN IN CHILE.—Of all the countries on the west coast of South America, Chile offers the best opportunity for the immediate sale of electrical goods, and the prospects for the future are bright. Germany dominated the market before the war, but, according to a report issued by the Bureau of Foreign and Domestic Commerce, Department of Commerce, American goods have recently made big gains. German goods had entered the market in the wake of German capital. Chile is a country where the natural resources and the will of the people make for progressive development along industrial and manufacturing lines, which means a steadily growing demand for power. Special Agent Philip S. Smith, author of the government's report, asserts that this should and will be furnished by harnessing the many waterfalls of the Cordillera of the Andes to electric generators and sending the current to all parts of the central section of the republic. One of the things that should not be overlooked in contemplating Chile as a future commercial field is the opportunity of uniting a safe investment with a profitable business. If advantage is taken of this situation, the relations already existing between the two countries can be strengthened to their mutual profit. The report analyzes different phases of the electrical goods business in both Chile and Bolivia and is designed to assist American firms in their efforts to build up and maintain business with the two countries. Under the title "Electrical Goods in Bolivia and Chile," Special Agent Series No. 167, it is sold at the nominal price of 20 cents by the Superintendent of Documents, Washington, D. C., and by all the district and cooperative offices of the Bureau of Foreign and Domestic Commerce.

THE WAR LABOR POLICIES BOARD of Washington, D. C., authorizes the following statement of the position of the production departments of the government concerning child labor and prison labor: All work required in carrying out a contract shall be performed in full compliance with the laws of the state, territory, or District of Columbia, where such labor is performed. A contractor shall not directly or indirectly employ in the performance of this contract any minor under the age of fourteen years or permit any minor between the age of fourteen and sixteen years to work more than eight hours in any one day, more than six days in any one week, or before 6 a. m. or after 7 p. m.; nor shall the contractor directly or indirectly employ any person undergoing sentence of imprisonment at hard labor which may have been imposed by a court of any state, territory or municipality having criminal jurisdiction.

ENGLAND TAKES STEPS TO PRODUCE LAMP BULBS.—At the annual meeting of the Metropolitan Carriage, Wagon & Finance Company, held recently at Birmingham, Eng., F. Dudley Docker, the chairman, said: "At the outbreak of the war the manufacture of glass bulbs for electric lamps had been almost exclusively done abroad. I am glad to say that, in conjunction with the General Electric Company, we have agreed to purchase the British rights in special machines for making these glass bulbs, and we hope soon to have the first machine installed and at work, when Great Britain will be independent, as far, at any rate, as the manufacture of these bulbs is concerned. We do not, however, seek to establish any monopoly, but will be ready to grant licenses on favorable terms to any British firms. The chief object of our developments has been to insure self-support to this country in trade and business that in the past have been, in some degree, controlled by other nations. I want you to lay hold of this fact, and I am happy to say that others, too, are looking ahead in the hope that when our long-delayed victory in the battlefield is crowned by a lasting peace we shall be found ready to take our proper position in the industrial competition that is certain to follow, and hold a winning place."

FEDERAL TRADE COMMISSION ACTS AGAIN TO CURB RESALE PRICE MAINTENANCE.—Acting again to prevent the practice of manufacturers of dictating the prices at which their goods shall be resold by retailers, the Federal Trade Commission has filed formal complaint against four nationally known firms. The commission declared it had reason to believe that resale price maintenance was being practiced by the Goodyear Tire & Rubber Company, Akron, Ohio; the Auto Strop Safety Razor Company, New York; the Kryptok Sales Company, New York, and the D. M. Ferry Seed Company, Detroit. All were charged with refusing to sell to retailers who "cut" prices to the public. Additional allegations were lodged against the Goodyear company, including charges of misleading advertising regarding "Goodyear service stations," exercise of "arbitrary control" over dealers, and other trade methods designed to stifle free competition. It also was charged that, through "an arbitrary control over the business of dealers," the company forces dealers under threat of price discrimination to maintain in stock excessive supplies of Goodyear products, to maintain standard prices for these, to report "underselling" by other dealers, and to specify Goodyear equipment on automobiles, motor trucks and motorcycles they may handle. It further was alleged that the company sells tires at dealers' prices direct to large truck users on condition that a fixed percentage, usually 90 per cent. of a concern's monthly requirements, be filled with Goodyear tires and supplies. The cases will be heard in Washington beginning late in August and extending into September.

RALPH KINGERY of Kingery & Marrs, lighting fixtures, Portland, Ore., recently announced that he will retire from business.

THE WAR TRADE BOARD of Washington, D. C., has issued a special circular on partial shipments on export licenses, effective July 10.

I. D. LANDIS has been appointed sales manager of the John D. Godfrey Company of Elkhart, Ind., manufacturer of coal-handling equipment.

H. E. STOCKER, production manager of the Fort Wayne works of the General Electric Company, has tendered his resignation and will become general manager of the International Clay Machinery Company of Dayton, Ohio.

THE UNDER-FEED STOKER COMPANY OF AMERICA, Chicago, has removed its office in Cincinnati, Ohio, from the Union Trust Building to the Union Central Building, Fourth, Vine and Baker Streets, where S. A. Williamson is the company's representative.

THE HENRY R. WORTHINGTON COMPANY of Harrison, N. J., manufacturer of pumping equipment, is said to be considering plans for extensions to its plant on property recently acquired adjoining its works, at Ann Street and Ogden Avenue. The property is about 65 ft. by 225 ft.

THE STANDARD UNDERGROUND CABLE COMPANY of Perth Amboy, N. J., has completed arrangements for the erection of a proposed new local plant at Fords, N. J. It is planned to commence construction work at an early date. The new works, it is said, will give employment to about 2000 men.

THE DEPARTMENT OF COMMERCE of Washington, D. C., has now available, in a single volume, complete foreign trade statistics for 1917, entitled "Commerce and Navigation of the United States, 1917." Copies may be had by applying to the Superintendent of Documents, Government Printing Office, Washington, D. C.

CECIL B. WHITEHURST, specialty sales manager of the Western Electric Company at Richmond, Va., died on July 6 after an illness of nearly a year. He was thirty-two years of age and had been a resident of Richmond for ten years. Mr. Whitehurst was graduated from the Agricultural and Mechanical College of North Carolina.

THE NATIONAL WAR LABOR BOARD of Washington, D. C., announces that the following firms have submitted to arbitration differences with their employees: Bridgeport Brass Company, Connecticut Electrical Manufacturing Company of Bridgeport, Conn.; Bryant Electric Company, Electric Cable Company, Harvey Hubbell, Inc., and Sprague Meter Company.

P. F. APFEL of the Electric Sales Corporation, Seattle, Wash., is establishing a Canadian factory in Toronto, Canada, for the manufacture of Apfel's systems of electrict heating. The company recently received a large order for electric heating apparatus to be installed for the Granby Mining & Smelting Company at Anyox, B. C. The mining company tried out the plan of electric heating for several months before placing the order.

ALFRED O. DICKER will in the future represent the Luminous Unit Company and the St. Louis Brass Manufacturing Company, manufacturer of Brascolite and general lighting fixtures, in the Chicago and Illinois territory. The Brascolite agency in this territory was formerly held by the Electrical Sales Engineers, Inc., of which Alfred O. Dicker was an officer. The new office of Mr. Dicker will be in Room 1109, 108 South La Salle Street, Chicago.

THE DEPARTMENT OF COMMERCE of Washington, D. C., made public recently a complete report on the Australian customs service through the Bureau of Foreign and Domestic Commerce. The bulletin is entitled "Customs Tariff of Australia," tariff series No. 37, and is the work of Louis Domeratzky, tariff expert of the bureau. Copies may be had at the price of 10 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C.

THE BOSCH MAGNETO COMPANY of Springfield, Mass., which was recently taken over by the United States government, will probably be sold in the near future to the highest bidder, if A. Mitchell Palmer, federal custodian of enemy property, consents. The Bosch plant at Plainfield, N. J., has already been sold to the Wright-Martin Aircraft Company. The Springfield plant, which has recently been appraised and found to be in first-class condition, is now handling the largest business in its history. When it was operated by alien owners it was producing only about 50 per cent of the present output. Many thousands of magnetos are now being turned out on government orders for delivery during the present year, and it is expected that additional orders will be received when the present demands are met.

Trade Publications

INDEX TO BULLETINS.—An index to bulletins (July, 1918) is issued by the General Electric Company, Schenectady, N. Y.

DESK OR TABLE LAMPS.—The Rutherford Brothers Company, Muncie, Ind., issues a leaflet covering ornamental and adjustable electric lamps for home or office.

SAFETY SWITCHES.—A leaflet describing a line of knife switches inclosed in steel boxes has been issued by W. A. McCombs & Company, Union Arcade, Pittsburgh, Pa.

PUSH-BUTTONS.—Leaflet C R 2940, describing and illustrating a standard line of push-button stations, is available from the General Electric Company, Schenectady, N. Y.

ELECTRIC APPLIANCES. — "Labor Savers for the Home" is the title of a booklet describing domestic appliances issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

POLYPHASE INDUCTION MOTORS.—Bulletin No. 41,302A, covering construction details of squirrel-cage and slip-ring motors, has recently been sent out by the General Electric Company, Schenectady, N. Y.

HEATING AND COOKING APPLIANCES.—An extensive line of electrical appliances from flatirons to six-plate ranges is described in catalog C, National Electric Heating Company, Ltd., Toronto, Canada.

FLOOR SURFACES.—Machines for surfacing both stone and wooden floors are described in catalogs being distributed by the American Floor Surfacing Machine Company, 520 South St. Clair Street, Toledo, Ohio.

EQUIPMENT FOR MINES.—A four-page pamphlet has just been issued by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., describing battery-charging equipment for mines and, in particular, racks for charging miners' lamps.

LINEMEN'S TOOLS.—The Bush Electric Tool & Manufacturing Works, Redlands, Cal., has just issued a catalog describing safety tools for use on high-tension lines, with illustrations showing how the tools are used in actual practice.

TRIPLEX POWER PUMPS.—Single-acting and double-acting vertical pumps are described in bulletin D-702, sent out by the Worthington Pump & Machinery Corporation, 115 Broadway, New York. Dimensions and capacities are fully set forth.

WIRING ACCESSORIES.—A considerable line of floor boxes and other hardware used in interior conduit work, as well as clamps and supports for wires and cables for outdoor service, is covered in catalog 33, just announced by the Steel City Electric Company, Pittsburgh, Pa.

HEATING DEVICES.—The Hughes Division, 211 West Schiller Street, Chicago, of the Edison Electric Appliance Company has issued a new catalog covering its complete line. This includes ranges, table appliances, bake ovens, hotel equipment, etc. It is ready for distribution now.

INSULATION.—The Redmanol Chemical Products Company, 636 West Twenty-second Street, Chicago, has issued a thirty-two-page illustrated booklet on its molding compounds, impregnating liquids and transparent "Redmanol." The booklet shows pictures of many irregular and small insulating shapes.

GAS AND OIL ENGINES.—Engines sold by the National Transit Pump & Machine Company, 320 Reliance Building, Kansas City, Mo., form the subject matter of a leaflet recently sent out by this company. The company makes oil engines of the Diesel type and both two-cycle and four-cycle gas engines of all sizes.

AIR-COMPRESSOR PLANTS. — The American Floor Surfacing Machine Company, 520 South St. Clair Street, Toledo, Ohio, has issued a catalog of air-compressor units suitable for garage or similar service. Capacities range from 2 cu. ft. to 6 cu. ft. per minute and for pressures up to 125 lb.

ELECTRIC RADIATOR.—The Electro Steam Radiator Company, 125 South Wells Street, Chicago, has issued a 20-in. by 24-in. folder on its electro-steam radiator, which it purposes to push actively in the near future. The folder describes the radiator and gives suggestions for its use. Testimonials as to its efficiency and usefulness are also shown.

SYNCHRONOUS MOTORS.—The Electric Machinery Company, Minneapolis, has issued two bulletins, Nos. 189 and 190, entitled respectively "Let's Make This Matter of Power Factor as Plain as A B C" and "Digest on Power Factor." Both bulletins are designed to show the advantage of synchronous motors in increasing power factor on central-station company lines.

PYROMETRY AND TEMPERATURE CONTROL.—Catalog 87, just issued by the Leeds Northrup Company, 4901 Stenton Avenue, Philadelphia, describes many devices for use in connection with the determination and control of temperature of furnaces. These devices are based on the potentiometer principle. The publication includes a full discussion of the theory of this apparatus and its application to various furnace problems.

STREET LIGHTING.—"The New Era in Street Lighting" is the title of a thirty-six-page book recently published by the Holophane Glass Company, 340 Madison Avenue, New York City. This book describes and illustrates the results of recent scientific research and shows how these results have been practically applied to street lighting. This book should prove of special value at the present time because it explains what is meant by conservation in street lighting and shows how to effect marked economies, such as the reduction of energy consumption by one-half for illumination as effective as that formerly used. A limited number of these books are available for distribution to engineers and city officials and may be obtained by them, in their official capacity, by addressing the Holophane company.

New Incorporations

THE PACIFIC COAST ELECTRICAL & SUPPLY COMPANY of Los Angeles, Cal., has been incorporated with a capital of $25,000 by C. E. Vermilyea, J. Vermilyea, C. J. Harmer, R. E. Harmer and A. D. Pearce.

THE ELECTRICAL PRODUCTS CORPORATION of Richmond, Va., has been chartered with a capital stock of $150,000 to deal in electrical supplies. S. O. Lindeman is president of the company and Harold S. Bloomberg is secretary.

THE HILLSBORO TELEPHONE & TELEGRAPH COMPANY of Waco, Tex., has filed articles of incorporation under the laws of the State of Delaware, with a capital stock of $80,000, for the purpose of manufacturing telephone and telegraph apparatus..

THE STANDARD APPLIANCE COMPANY OF AMERICA of New York, N. Y., has been incorporated by J. L. Volz, E. Goodman and N. Shaw, 32 Cooper Square, New York City. The company is capitalized at $95,000 and purposes to manufacture telephone equipment.

THE AMALGAMATED ENGINEERING COMPANY of Troy, N. Y., has been incorporated with a capital stock of $250,000 to manufacture machines, devices and appliances for generation and use of power. The incorporators are: J. E. Falls, R. Reece and R. C. Hilton of Troy.

THE GLOBE ENGINEERING COMPANY OF CANADA of Winnipeg, Man., has been incorporated by Oliver F. Lightcap, John L. Harrison, Alexander J. Milligan and others. The company is capitalized at $100,000 and purposes to manufacture engines, dynamos, generators, batteries, machinery, etc.

THE AUTOARC WELDING TOOL COMPANY of Brooklyn, N. Y., has been incorporated by W. W. Stockbridge, V. D. Borst and J. E. Zelenko, 41 Park Row, New York, N. Y. The company is capitalized at $1,000,000 and purposes to do a general contracting and electric welding and mechanical engineering business.

THE GEORGE F. ROHN ELECTRIC COMPANY of Milwaukee, Wis., has been chartered with a capital stock of $60,000 to take over the business of George F. Rohn, 524 Jackson Street, manufacturer of electrical equipment and general electrical contractor. The incorporators are George F. Rohn, H. J. Jung and Alfred W. Rohn.

New England States

LEWISTON, ME.—Arrangements are being made by the Lewiston, Augusta & Waterville Street Railway Company for a complete rehabilitation of the service between Lewiston and Bath and improvements to other lines. The United States Shipping Board Emergency Fleet Corporation has agreed to assist the company to the amount of $165,000, by providing new cars, transformers, transmission lines and other equipment. It is also proposed to reinsulate and improve the feed lines and increase the voltage from Lewis to Bath from 10,000 volts to 22,000 volts.

NEWMARKET, N. H.—Work has begun on the construction of an addition, 40 ft. by 45 ft., to the power plant of the Newmarket Manufacturing Company.

PORTSMOUTH, N. H.—Work has begun on laying the cable from the power plant of the Rockingham County Light & Power Company to Badger's Island. This cable when completed will furnish energy to operate the Portsmouth, Dover & York Street Railway.

ROCHESTER, N. H.—The Twin Gas & Electric Company is erecting a new plant on Wallace Street.

RUTLAND, VT.—The Vermont Evaporator Company, it is reported, will locate on Strong Avenue. The Rutland Railway Light & Power Company will furnish all power used by the company.

RUTLAND, VT.—Contract has been awarded by the Rutland Railroad Company to Westinghouse, Church, Kerr & Company, 27 Wall Street, New York, N. Y., for construction of a machine shop, 105 ft. by 263 ft., one-story, and a repair shop, 125 ft. by 175 ft.

FAIRHAVEN, MASS.—Plans are being prepared by the New Bedford (Mass.) Gas & Electric Company for the erection of a transformer station, 20 ft. by 40 ft., in Fairhaven.

MILLBURY, MASS. — The Millbrook Linen Works is reported to have purchased the Atlanta Mill water power and land on South Main Street.

PITTSFIELD, MASS.—Contract has been awarded by J. & E. H. Wilson, Wahconah Street, for the erection of a new turbine plant at its works to D. Herbert Pike, 28 Renne Street, Pittsfield.

WEBSTER, MASS.—Work has started on the construction of a hydroelectric power plant in Farnumsville for the Slater Mills of Webster. E. D. Ward, of Worcester, Mass., is contractor.

WORCESTER, MASS.—The Worcester Electric Light Company has petitioned the city clerk for permission to build conduits and manholes on Grafton, Temple and Franklin Streets.

NEW LONDON, CONN.—The New London Ship & Engine Company has awarded contract for the construction of power house, 50 ft. by 90 ft., one-story, to the J. H. Crozier Company, Hartford, Conn.

Middle Atlantic States

ALBANY, N. Y.—Plans have been prepared by the Municipal Gas Company for an addition to its boiler plant at 71 Trinity Place, to cost about $5,000.

ALBANY, N. Y.—Bids will be received by Dr. H. M. Biggs, commissioner of health, State Department of Health, Capitol, Albany, until July 30 for electric elevator for Laboratory Building, Division of Laboratories, State Department of Health, Albany. Lewis F. Pilcher is state architect.

AUSABLE FORKS, N. Y.—The Ausable Forks Electric Company, recently incorporated with a capital stock of $25,000, proposes to construct and operate an electric lighting system in Ausable Forks. G. Chahoon, J. Rogers and others are interested.

BATAVIA, N. Y.—A 200-hp. electric motor is being installed in the plant of Roberts Brothers to replace the gas engines.

BROOKLYN, N. Y.—Bids, it is reported, are being received by the National Lead Company, 111 Broadway, New York City, for the construction of a five-story building, 50 ft. by 210 ft., at its Atlantic Works, Marshall Street, Brooklyn, to cost about $175,000.

LONG ISLAND CITY, N. Y.—The General Vehicle Company has discontinued the manufacture of motor trucks since its works at Hunters Point, Long Island City, has been taken over by the government for the manufacture of airplane engines. The company, it is understood, will make other arrangements for handling parts and repair works for its motor trucks. The manufacture of motor trucks has been discontinued entirely.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

NEW YORK, N. Y.—Plans are being prepared for the erection of a ten-story refrigerating plant for Armour & Company at Tenth Avenue and Marginal Street, to cost about $1,000,000. R. C. Clark, care Armour & Company, Union Stock Yards, Chicago, Ill., is architect. The New York office of the company is at 120 Broadway.

NEW YORK, N. Y.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until July 31 for the installation of an electric passenger elevator and two electric coin lifts in the United States Assay Office Building, New York City.

NEW YORK, N. Y.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 29 for installation of an electric lighting and power system in shipbuilding slip No. 2, (specification 3136) to cost about $20,000; also for installing mechanical stokers (specification 3124) at the New York Navy Yard.

RICHMONDVILLE, N. Y.—Action has been taken to have the franchise of the Great Bear Light & Power Company of East Worcester annulled. The company, which has not furnished street-lamps since last December, has now discontinued commercial service. Steps will be taken to organize a local lighting company or make arrangements to secure service from some other concern.

SHORTSVILLE, N. Y.—A new 200-hp. semi-Diesel oil engine is being installed in the plant of the Papec Machine Company. Other improvements are contempalted by the company, including the installation of new boilers and a steam engine.

SYRACUSE, N. Y.—Plans are under consideration by the City Council for the construction of a new pumping station (electrically operated) on Fellows Avenue near Dakota Street.

ELIZABETH, N. J.—The Crescent Truck Company, 347 First Avenue, Elizabeth, has purchased from the S. L. Moore & Sons Corporation of Elizabethport all rights to and interest in the Crescent electric industrial truck and will manufacture it in connection with its line of allied equipment.

EWING, N. J.—Bids will be received by the Township Committee until Aug. 3 for furnishing electric street-lighting service for a period of five years, beginning Sept. 1, 1918.

HAMILTON, N. J.—An appropriation of $10,000 has been approved by the Township Committee in its annual budget to provide for various lighting purposes for a period of one year.

JERSEY CITY, N. J.—An appropriation of $10,000 has been approved by the Board of Freeholders to be used by the Boulevard Commission for improvements in the electric street-lighting system on the Boulevard between Bergen Point and the Paterson Plank Road.

NEWARK, N. J.—The Public Service Railway Company is planning to erect a building, 160 ft. by 500 ft., for the car works at Bloomfield Avenue and Lake Street, to cost about $45,000.

ALTOONA, PA.—The Penn Central Light & Power Company has filed notice with the Public Service Commission of an issue of $29,000 in bonds, of which part of the proceeds will be used for extensions and improvements.

COALDALE, PA.—Bids will be received by John R. Doyle, secretary state hospital, until July 25 for construction of dining pavilion and boiler house. Separate bids to be submitted on general contract, steel work, power plant, wiring, plumbing, etc.

EASTON, PA.—Notice has been filed with the Public Service Commission by the Pennsylvania Utilities Company of an issue of $143,000 in securities, the proceeds to be used for extensions and improvements to its system.

HARRISBURG, PA.—Plans have been prepared by the American Telephone & Telegraph Company for improvements in its local system, including the installation of an underground conduit system in Walnut and Third Streets, to replace the overhead lines now in use.

LATTIMER, MINES, PA. — Pardee Brothers & Company, it is reported, are contemplating the installation of electrical equipment in connection with the reopening and development of its Hollywood colliery in the Hazleton district.

MARYSVILLE, PA.—The Juniata Public Service Company has begun work on improvements to its system in the Marysville section.

NICETOWN, PA.—Bids, it is reported, are being received by the Midvale Steel & Ordnance Company, Widener Building, Philadelphia, for the construction of three buildings at its works, consisting of a one-story shop, 114 ft. by 180 ft., to be used for rough machine works; a machine shop, 183 ft. by 560 ft., for finishing work, and a heat-treatment building, 75 ft. by 580 ft.

PHILADELPHIA, PA.—The power plant of the William & Harvey Rowland Company at Lewis and Tacony Streets, Frankford, was recently damaged by fire, causing a loss of about $20,000.

PHILADELPHIA, PA.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 29 for installing two electric traveling cranes at the air craft factory, under specification 3202, at Philadelphia.

PHILADELPHIA, PA.—Plans are being prepared by the United States government for the erection of new buildings at the Frankford Arsenal, Philadelphia, to cost about $1,000,000. Contract has been awarded for the construction of a shop, 52 ft. by 123 ft., with wing 30 ft. by 30 ft., to cost about $200,000, to William R. Dougherty, 1601 Sansom Street, Philadelphia.

PHILADELPHIA, PA.—Plans are being prepared by the Pennsylvania Railroad Company for improvements to its various yards, including the erection of a new engine house at Pitcairn, Pa., which will also include a machine shop; extension to its engine house at Shire Oaks, and also for an addition to the engine house at Orangeville, near Baltimore, Md. A. C. Shand is chief engineer.

PITTSBURGH, PA.—The Cheat River project, started by the Kuhn banking interests in 1911 and halted when on its way to completion by financial troubles, is understood to be under investigation by government experts with a view of having the power plant completed. It is estimated that the Cheat River dam would provide about 50,000 hp. The plant is planned for an 86-ft. head of water and was built to accommodate four generating units of 12,500 hp. each.

READING, PA.—Notice has been filed with the Public Service Commission by the Metropolitan Edison Company of an issue of $142,500 in bonds, the proceeds to be used for improvements. The company is planning to install a new 25,000-kw. turbo-generator in the near future.

SHARON, PA.—The Savage Arms Corporation of Utica, N. Y., is planning an addition to the power plant at its local works, to cost about $70,000. The work will be done under the supervision of Westinghouse, Church, Kerr & Company, 37 Wall Street, New York City.

ANNAPOLIS, MD.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 29 for ash-handling equipment under specification 3186, to cost about $16,000.

BALTIMORE, MD.—The United Railways & Electric Company is now installing a 20,000-kw. turbo-generator in its Pratt Street power station.

BALTIMORE, MD.—The Washington, Baltimore & Annapolis Electric Railway Company is contemplating the construction of a terminal station and additional tracks in Baltimore, to cost about $300,000. J. J. Doyle is general manager.

HARTLAND, W. VA.—Extensions are being made by the Hartland Power Company in its transmission system to Beechy Creek for furnishing power to the Elkland Mining Company. Plans are under consideration by the company for the erection of an electric transmission line to Dorfee for the purpose of furnishing service to the mines of the Big Block Coal Company, the Elkhurst Coal Mining Company, the Thompson Block Coal Company and the Foy Splint Company. The Hartland company is operated by W. S. Barstow & Company, 50 Pine Street, New York, N. Y. Hartland has not a post office.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 29 for installing mechanical stokers at Hampton Roads, Va., under specification 3124. The cost is estimated at about $21,000.

WASHINGTON, D. C.—The Bureau of Yards and Docks, Navy Department, has awarded contract for construction of power plant to Gillis & Geoghegan, 537 Broadway, New York, N. Y., at $44,000.

WASHINGTON, D. C.—Appropriations have been granted by Congress for the New England district as follows: For machine shop and foundry at the Boston Navy Yard, $900,000; addition to machine shop, $200,000; addition to foundry, $130,000, and improvements to power plant, $150,000, at the Portsmouth Navy Yard, N. H.; enlargement of the submarine base at New London, Conn., including the construction and equipment of repair shops, $750,000; for enlarging boiler and engine room at the Springfield (Mass.) Arsenal, $225,000.

North Central States

GRAND RAPIDS, MICH.—Material has arrived for the new street-lighting system, which will be installed as soon as possible. The arc lamps now in use will be replaced with nitrogen lamps.

JACKSON, MICH.—The capital stock of the Michigan Light Companw has been increased from $5,925,000 to $6,080,900.

LANSING, MICH.—Plans are being considered by the Olds Motor Works of Lansing for the construction of a new motor plant, to cost about $1,000,000. The work will include the erection of a factory building, 240 ft. by 500 ft. and a concrete loading dock, to cost about $600,000. The equipment will cost about $500,000.

CINCINNATI, OHIO.—The George B. Curd Company, Union Central Building, is contemplating the purchase of a 75-kw., 220-volt direct-current generator, directly connected to engine.

CLEVELAND, OHIO—The Chandler Motor Car Company, it is reported, will erect two temporary buildings, one 44 ft. by 220 ft. and the other 30 ft. by 240 ft., to be used for the manufacture of tractors. The company has a large contract for 10-ton tractors for the government.

COLUMBUS, OHIO—Hoisting equipment will be purchased by the city of Columbus for use in the new municipal coal yard.

DAYTON, OHIO.—The State Public Utilities Commission has authorized the Dayton Power & Light Company to issue $56,000 in capital stock at not less than 85, the proceeds to be used for the installation of a new switchboard at the Fourth Street station.

LORAIN, OHIO—Plans are being considered for improvements to the ornamental lighting system on Broadway and extending it to Eighth Street. It is proposed to transfer the lighting system from the city to the Lorain County Electric Company.

ANDERSON, IND.—Contract has been awarded to Davis & Hunt, Dayton, Ohio, for the construction of an addition to the Remy Electric branch of the United Motors Corporation a' Anderson. The proposed building will be 50 ft. by 300 ft., four-stories high.

RICHMOND, IND.—The City Council has appropriated $55,000 for the construction of a dam across the Whitewater River and improvements to the municipal electric light plant.

SOUTH BEND, IND.—Permits have been taken out by the Studebaker Corporation for erection of three buildings, consisting of a steel forge shop, 162 ft. by 306 ft., one-story; concrete machine shop, 200 ft. by 576 ft., and a crane runway. The cost of the work is estimated at about $270,000.

VINCENNES, IND.—The Vincennes Traction Company has abandoned its local power station and is purchasing energy from the Indiana Power & Water Company.

CHICAGO, ILL.—The Baldwin Locomotive Works, it is reported, are contemplating the construction of a new locomotive plant at Chicago, to cost about $5,000,000.

HOOPESTON, ILL.—A substation is being erected at the plant of the Hoopeston Gas & Electric Company. A. W. Mann of Mattoon has charge of construction.

LA HARPE, ILL.—The Western Illinois Utilities Company, recently incorporated, it is understood, will acquire the electric properties at La Harpe and Blandinsville. The company also proposes to erect an electric transmission line to Dallas City (21 miles long) to connect with the transmission system of the Mississippi River Power Company, to secure electricity to operate its system. Branch lines, it is expected, will also be erected to Stronghurst, Terre Haute, Raritan, Sciota and Good Hope.

MARSHFIELD, WIS.—Bonds to the amount of $60,000 have been authorized by the Board of Education for the construction of a vocational training institute and junior high school building.

MILWAUKEE, WIS.—The Downing Box Company, recently incorporated, is planning to erect a factory, 100 ft. by 400 ft., at Third and Indiana Avenues. The plans include a power plant. The company is capitalized at $300,000.

RACINE, WIS.—The Racine Electric Company has increased its capital stock from $25,000 to $100,000. H. Vanbree is president of the company and John W. Ruggabert is secretary and acting manager of the plant.

INDEPENDENCE, IOWA.—The Fayette County Utilities Company of Oelwein has submitted a proposal to the City Council offering to furnish electricity to operate the municipal electric lighting system.

ANDERSON, MO.—Bonds to the amount of $10,000 have been voted for the purpose of establishing a municipal electric light plant and water-works system.

LATHROP, MO.—An election will soon be called to submit the proposal to grant the Light, Heat & Power Company a franchise to construct and operate an electric light and power plant in Lathrop.

PEMBINA, N. D.—The Pembina Light & Power Company is contemplating extending its transmission lines from Bathgate to Hamilton and to St. Thomas and east to Drayton.

GRAND ISLAND, NEB.—At the request of the National Fuel Administration to conserve coal, the City Council and the officers of the Central Power Company are considering merging their electric generating plants during the period of war.

HOMER, NEB.—Bonds to the amount of $7,500 have been voted for the installation of an electric lighting system.

CHANUTE, KAN.—The City Council is considering calling a special election to vote on the proposal to issue $35,000 in bonds for extension to the municipal electric light plant.

Southern States

PARIS ISLAND, S. C.—Contract has been awarded by the Bureau of Yards and Docks, Navy Department, Washington, D. C., to J. Griffith & Sons, 112 West Adams Street, Chicago, Ill., for extension to marine barracks, including electric lighting and steam, water and sewer systems, etc.; construction of sea wall, piers, etc. The cost of the work is estimated at $1,666,000.

SUMTER, S. C.—The question of municipal ownership of the electric lighting plant is under consideration.

ATLANTA, GA.—The Warford Shoals Light & Power Company is contemplating an issue of $50,000 in bonds.

AUGUSTA, GA.—Contract has been awarded by the city of Augusta for the installation of a transformer, to cost $6,575.

JACKSONVILLE, FLA.—The War Department, Washington, D. C., has awarded contract for the construction of buildings, including installation of an electric lighting system, water and gas service, etc., in connection with development of city, near Jacksonville, for shipbuilders to W. P. Richardson of Jacksonville. The proposed project consists of the erection of 165 buildings of cottage and bungalow type, to cost about $750,000.

TULLAHOMA, TENN.—Arrangements are being made by the Public Light & Power Company for the construction of an electric transmission line from Tullahoma to Manchester.

HUTTIG, ARK.—The power plant and a portion of the planing mill of the Union Sawmill Company was recently destroyed by fire, causing a loss of about $40,000.

LITTLE ROCK, ARK.—Contract has been awarded by the War Department, Washington, D. C., to George W. Donaghey of Little Rock for erection of headquarters supply warehouse for aviation field in west Tennessee, Arkansas, Oklahoma and northern Texas. The warehouse building will be 400 ft. by 800 ft., and the barracks will accommodate 500 privates and non-commissioned officers and quarters for officers and officers' clubs. The plans provide for an initial expenditure of $500,000.

LAFAYETTE, LA.—The Benners Salt Company, P. O. Box 836, New Orleans, La., would like to receive prices on crude-oil engines, electrical equipment, mining machinery, crushers, mills, etc., to be installed at its works at Lafayette.

NEW ORLEANS, LA.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Aug. 12 for boilers and superheaters at the local navy yard, under specification 3165, to cost about $25,000.

PLAQUEMINE, LA.—Plans are under consideration by James Black and others to establish a shipbuilding plant, eight ways, including an electric lighting system, sawmill, trolley system, etc.

AUSTIN, TEX.—The City Council is considering the purchase of electrical energy from the Austin Power Company to operate the municipal electric lighting plant. Guy A. Collett is receiver of the power company.

Pacific and Mountain States

SEATTLE, WASH.—Preparations are being made by the Northwest Motor Company of Seattle for the construction of a foundry and machine shop on the Duwamish Waterway. They will be 90 ft. by 250 ft., equipped with iron melting cupola, electric steel furnace and overhead traveling crane. The cost of the initial unit is estimated at $150,000. A. P. Nute is president.

TACOMA, WASH.—Bids will be received by Hamilton F. Gronen, commissioner of light and water, Tacoma, until Aug. 2 for furnishing renewal parts for a 65-cell, 200-amp. storage battery or a complete new battery.

PORTLAND, ORE.—Work has begun on the installation of the steam pipe line leading from the new plant of the Northwestern Electric Company to the heating system in the business section of the city.

PORTLAND, ORE.—Rapid progress is being made on the construction of the new auxiliary power plant of the Northwestern Electric Company. The plant is located on a site adjoining the mill of the Portland Lumber Company in South Portland. Mill refuse from the lumber company's plant will be used for fuel. The generating capacity of the plant will be about 10,000 kw. and will cost about $2,000,000.

FRESNO, CAL.—The California Associated Raisin Company of Fresno is contemplating the construction of a power plant, 85 ft. by 154 ft., at its works at Sun Maid City.

RIVERSIDE, CAL.—Plans are being considered by the Nevada-California Power Company and the Southern Sierras Power Company, a subsidiary, to increase the output of their power plants, known as Nos. 2, 3, 4, 5 and 6, at Birch Creek, Inyo County, to cost approximately $85,000.

MESA, ARIZ.—The Board of Supervisors of Maricopa County has granted the South Side Gas & Electric Company a franchise to erect and operate electric transmission lines on certain roads and highways in Maricopa County.

POPLAR, MONT.—The local power company contemplates the installation of another engine unit at the city pumping station to furnish an all-night electric lighting service for the city.

Canada

VANCOUVER, B. C.—Mundy, Rowland & Company, electrical contractors, Standard Bank Building, Vancouver, have recently been awarded contract by the Lyall Shipbuilding Company for electrical installations on six auxiliary schooners.

NIPIGON, ONT.—Plans are under consideration for a hydroelectric power development on the Nipigon River at Nipigon, about 60 miles from Port Arthur, to supply electricity at Port Arthur and Fort William. The proposed plant will cost about $3,000,000, and develop about 135,000 hp.

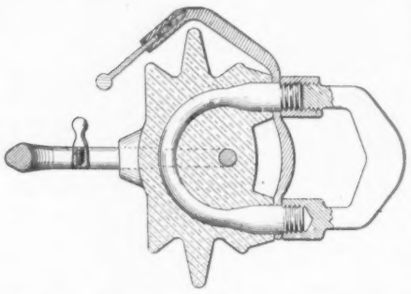
OTTAWA, ONT.—Bids will be received by John A. Pearson, architect, and J. O. Marchand, associate, Centre Block, Parliament, Ottawa, until Aug. 2 for coal and ash-handling equipment required in the construction of the central heating plant of the Parliament Buildings.

TORONTO, ONT.—Orders in Council have been passed by the Ontario government authorizing an increase in electrical equipment at Niagara Falls to the extent of $500,000; also authorizing the development of 25,000 hp. to 30,000 hp. at High Falls on the Rideau and on the St. Lawrence between Cornwall and Brockville.

WESTON, ONT.—Bids will be received by the chairman of the Water, Power and Light Commission, Weston, until July 30 for construction of extension to pump and filter house at Weston. James, Loudon & Hertzberg, Ltd., 36 Toronto Street, Toronto, are consulting engineers.

1,270,028. DRIVING MECHANISM; Clark T. Henderson, Milwaukee, Wis. App. filed June 1, 1914. Provides means for effecting the drive of a member at predetermined successive speeds irrespective of variations in the load of such member.

1,270,048. ELECTRIC FUSE PLUG; Thomas E. Murray, New York, N. Y. App. filed Dec. 29, 1916. A type wherein the contacts are respectively a threaded shell and a plate.



1,270,457—Strain Insulator Provided with Detachable and Adjustable Arcing Means

1,270,062. TERMINAL BOX; Frederick L. Schulz and William Kraft, Toledo, Ohio. App. filed Aug. 21, 1916. A closed box having sheet-metal walls used as loom fasteners.

1,270,080. TELEPHONE TIMER AND SWITCH; Albert A. Wells, Detroit, Mich. App. filed May 4, 1917. A timer which limits the use of a telephone by a subscriber.

1,270,100. METHOD AND APPARATUS FOR DETERMINING THE FIELD STRENGTH OF DYNAMO-ELECTRIC MACHINES; Edwin C. Ballman, St. Louis, Mo. App. filed April 3, 1916. Determines the strength and condition of the permanent magnets of a magneto.

1,270,127. TELEPHONE-EXCHANGE SYSTEM; Francis W. Dunbar, Chicago, Ill. App. filed March 3, 1905. Adapted to systems in which cord circuits are employed for uniting subscribers' lines for conversation.

1,270,128. TELEPHONE SYSTEM; Francis W. Dunbar, Manchester, Vt. App. filed March 3, 1905. Means for distributing calls from calling subscribers' lines to idle link circuits by means of successively operated automatic devices.

1,270,134. SHIP PROPULSION; William L. R. Emmet, Schenectady, N. Y. App. filed April 5, 1916. Comprises an elastic fluid turbine and an alternating-current generator coupled to said turbine.

1,270,140. ELECTRIC BOILER; John N. Fuller, Philadelphia, Pa. App. filed Dec. 1, 1917. A heating coil formed of wire susceptible to an electric current.

1,270,143. BEAD CHAIN; William J. Gagnon, Bridgeport, Conn. App. filed Oct. 18, 1916. Consists of hollow balls and connecting dumbbell links, some of which are insulated.

1,270,198. ELECTRIC WATER HEATER; Leon F. Parkhurst, Schenectady, N. Y. App. filed Nov. 23, 1916. An electric heating device comprising a sheathed wire formed with a resistance core inclosed in a metal sheath.

1,270,235. STARTER FOR ELECTRIC MOTORS; George H. Whittingham, Pikesville, Md. App. filed Dec. 10, 1914. An automatic starter for motors, with a plurality of contact fingers.

1,270,268. LIGHT-DISTRIBUTING DEVICE; David Crownfield, Cambridge, Mass. App. filed Oct. 18, 1917. To enable illumination from an artificial light source to be directed at will upwardly or downwardly.

1,270,272. FUSE; Louis W. Downes and Ralph C. Patton, Providence, R. I. App. filed Oct. 12, 1916. Provided with an air space about its link for the purpose of completely extinguishing the arc.

1,270,277. TWO-WIRE AUTOMATIC AND MANUAL TELEPHONE-EXCHANGE TRUNKING SYSTEM; Edward D. Fales, La Grange, Ill. App. filed March 17, 1910. Provision is made for controlling switches over the two sides of the calling line in series.

1,270,303. HANDLE AND TERMINAL CONNECTION FOR ELECTRICALLY HEATED INSTRUMENTS; Frank Kuhn and Jay A. Hand, Detroit, Mich. App. filed Jan. 25, 1917. Obtains a simple construction of terminal which is housed within the handle.

Record of Electrical Patents

Notes on United States Patents

1,270,304. SOLDERING-IRON STAND; Frank Kuhn and Jay A. Hand, Detroit, Mich. App. filed Feb. 21, 1918. Equipped with a pivotal socket member with which an electric soldering iron may be very quickly engaged or disengaged.

1,270,326. CALL FINDER FOR AUTOMATIC AND SEMI-AUTOMATIC TELEPHONE SYSTEMS; John N. Reynolds, Greenwich, Conn. App. filed Dec. 13, 1916. Finds a calling line not already seized by another line finder and starts a line finder hunting for said calling line.

1,270,335. FUSE DEVICE; Edmund O. Schweitzer and Alfred Herz, Chicago, Ill. App. filed Dec. 17, 1914. Link confined between two blocks under pressure, the channel between blocks having one or more sharp reverse bends formed by what may be termed "baffle plates."

1,270,342. ELECTRIC VIBRATOR; Rude Stockinger, Manitowoc, Wis. App. filed Aug. 7, 1917. To reduce the heating of the magnetic coil to a minimum.

1,270,356. AUTOMATIC CIRCUIT BREAKER; George B. Wurster, Tuckahoe, N. Y. App. filed Sept. 17, 1917. Single piece of apparatus which will quickly and positively interrupt fire-alarm circuits.

1,270,362. ELECTRIC CABLE PROTECTING APPARATUS; Sydney N. Baruch, San Francisco, Cal. App. filed Oct. 23, 1916. For protecting against high static charges.

1,270,385. INTERRUPTER MECHANISM FOR IGNITION DYNAMOS; Alfred C. DeLorme, Newark, N. J. App. filed April 20, 1916. To increase the efficiency and lengthen the life of the contacts and their operating parts.

1,270,388. TELEPHONE-EXCHANGE SYSTEM; Bert G. Dunham, Hawthorne, N. J. App. filed Nov. 20, 1916. Automatic finder switches are apportioned to calling lines by an extended starter wire.

1,270,391. INCLOSED SAFETY FUSE; Alfred L. Eustice, Chicago, Ill. App. filed May 3, 1915. To increase the simplicity of manufacture of renewable cartridge fuses of the so-called ferrule type.

1,270,398. METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING SOUND WAVES THROUGH GROUND; Reginald A. Fessenden, Brookline, Mass. App. filed Oct. 7, 1915. Determines the location of the place of transmission of waves or impulses.

1,270,420. ELECTRIC VEHICLE WHEEL; John McL. Kingsbury, Great Falls, Mont. App. filed April 12, 1915. A driving wheel bearing its own motor element.

1,270,421. ELECTRIC VEHICLE CONSTRUCTION; John McL. Kingsbury, Great Falls, Mont. App. filed June 10, 1915. Electrical driving structure in which large gear ratios are eliminated.

1,270,457. STRAIN INSULATOR PROVIDED WITH DETACHABLE AND ADJUSTABLE ARCING MEANS; App. filed Nov. 14, 1916. To render them proof against destruction from high frequency and lightning.

1,270,465. AUTOMATIC SWITCHING MEANS; John F. Toomey, New York, N. Y. App. filed Sept. 13, 1916. Relates to battery-charging systems.

1,270,527. ELECTRIC VEHICLE WHEEL; John McL. Kingsbury, Great Falls, Mont. App. filed March 8, 1915. Arrangement of the parts for the purposes of compactness, simplicity and accessibility.

1,270,555. WIRING SYSTEM; Howard R. Sargent, Schenectady, N. Y. App. filed Aug. 24, 1914. To provide for all the practical requirements of a complete system of wiring.

1,270,563. DIRECTION SIGNAL FOR MOTOR VEHICLES; Wilson D. Stout, Los Angeles, Cal. App. filed May 28, 1917. An attachment to motor vehicles for the purpose of indicating the direction in which the vehicle is to turn.

1,270,636. ELECTRIC LIGHT EXTENSION; Ross H. McDaniel, Peru, Ind. App. filed April 14, 1917. An extensible portable lamp adapted for use particularly on automobiles.

1,270,661. POWER SYSTEM; Arthur R. Smith, Schenectady, N. Y. App. filed April 9, 1917. To utilize the non-condensing engine for driving the auxiliaries up to the point at which its exhaust can be efficiently utilized to heat the feed water.

1,270,671. ELECTRIC SWITCH; George B. Thomas, Bridgeport, Conn. App. filed Dec. 6, 1915. Mechanism adapted for use in electric sockets, pendent switches and the like.

1,270,687. ALTERNATING-CURRENT GENERATOR AND GROUP CONVERTER; Georges Belfils, Paris, France. App. filed Sept. 5, 1917. The construction of an alternator exciter machine or a group converter having an induction system common to the two machines.

1,270,723. TELEPHONE SYSTEM; Frank L. Goheen, Grouse, Idaho. App. filed June 5, 1917. For use in subscriber's stations of a party-line telephone system to prevent eavesdropping.

1,270,786. APPARATUS FOR ELECTRIC WELDING; Joseph B. Clapper, Lakewood, Ohio. App. filed Oct. 18, 1916. Having regard more particularly to tube-welding machines.

1,270,806. RAILWAY SIGNALING SYSTEM; Charles Le G. Fortescue, Pittsburgh, Pa. App. filed June 4, 1915. Special reference to track-circuit railway signaling systems which are operated by alternating currents.

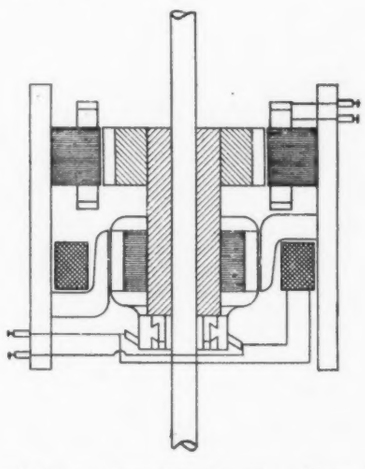
1,270,850. COMBINATION TRANSFORMER AND CIRCUIT BREAKER; William M. McConahey, Pittsburgh, Pa. App. filed Oct. 31, 1913. To provide an improved means for the disposition of electrical apparatus that shall be especially simple and economical of space.

1,270,851. THERMOSTATICALLY CONTROLLED CIRCUIT; James F. McElroy, Albany, N. Y. App. filed Nov. 3, 1914. Applied to an electric heater circuit.

1,270,856. SUPPORT FOR ELECTRIC LAMP FILAMENTS; Roy A. Mailey, East Orange, N. J. App. filed June 27, 1914. Employing two disks of aluminum or other metal and both lying within the reduced extension of the main lamp globe.

1,270,860. ELECTRIC WELDING PROCESS; Harold A. Newcomb, Wilkinsburg, Pa. App. filed May 11, 1914. The metals to be united are placed in contact with each other, heated by the passage of an electric current and caused to diffuse into each other by the application of pressure.

1,270,861. COMBINED TELEGRAPH AND TELEPHONE INSTRUMENT; Herman G. Pape, New York, N. Y. App. filed Feb. 1, 1915. A sound-reproducing instrument or a telephone receiver.



1,270,687 — Alternating-Current Generator and Group Converter

1,270,867. FUSE; Charles S. Price, Rutherford, N. J. App. filed Aug. 3, 1916. A fuse of relatively short length which will not introduce a dangerous fire hazard.

1,270,784. ELECTROLYTE CELLS, SUCH AS LIGHTNING ARRESTERS, CONDENSERS, AND THE LIKE; Lewis W. Chubb, Edgewood Park, Pa. App. filed Oct. 2, 1914. Refers to certain electrolytes which form high-resistance films upon the surfaces of aluminum, tantalum, platinum and magnesium.